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DEFENCE & ATTACK
OF
POSITIONS & LOCALITIES
BY
LT. COL. SCHAW.

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DEFENCE AND ATTACK

OF

POSITIONS AND LOCALITIES,

BY

LT.-COLONEL H. SCHAW, *Royal Engineers*,

PROFESSOR OF FORTIFICATION & ARTILLERY, STAFF COLLEGE.

Being the substance of some of the Lectures delivered by him
at the College in 1875.

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PREFACE.

Military Art, in all its branches, has been so eminently progressive during the last few years, that many works on the subject which formerly were regarded as standard, can no longer be taken as safe guides; nor is it by any means an easy task to supply their place, because the minds of men are now so earnestly directed to improving the Art of War, that new inventions are continually to be expected, each involving in a greater or less degree corresponding changes throughout the whole military system. It is, however, vitally important that these changes should be recognised and provided for as early as possible, and that each branch of the tree should keep pace with the growth of the others, and of the main stem. The present small volume is an attempt to put before the army generally, what the Author conceives to be the present necessities of Modern Civilised Warfare, as regards the uses to be made of Fortification and Artillery in active operations in the field.

Without going into questions of strategy, or into the details of the modern tactics of Infantry and Cavalry, the Author has endeavoured to point out how the altered tactics of these arms, as well as those of the Artillery, must influence the selection and preparation for defence of a position or a post, and the manner in which the defence or the attack should be carried out. The tactics of Artillery have been more fully treated of than those of the other arms; because in the course of his duties the Author's attention has been more particularly directed to this arm, and happily the tactics which are now suited to it, appear to be more nearly settled than those of Infantry and Cavalry.

Throughout the volume, the great principles have been kept in view that in War, as in every other art, a clear understanding of the object in view, an accurate knowledge of the available means, and a wise adaptation of those means to the end, are the main elements of success.

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ERRATA.

p. 56, line 13, for "half a mile to a mile," read "half a mile to 2½ miles."

p. 100, lines 9, 11, 27, 30, for "assaillants," read "assailants."

p. 105, line 23, for "21," read "2."

p. 107, line 7 from bottom, for "shovels," read "8 shovels."

p. 109, line 3, for "abont," read "about."

p. 114, line 27, for "and and its," read "and its."

p. 115, line 4, for "continential," read "continental."

CHAP. I

ON DEFENSIVE POSITIONS.

Defensive Actions may be classed under two heads—

Division into passive and active defence.

- a. *Passive* or delaying, in which the object is chiefly to ward off a blow, either to maintain possession of ground or to gain time.
- b. *Active*, in which the object is the defeat of the enemy, the defender fighting in a chosen position, with the intention of attacking his adversary when the favourable moment arrives.

Passive defence.

When adopted.

Passive Defence is the attitude of a force of acknowledged inferiority to its opponent, and its highest type is to be found in the defence of a fortress; but approaches to this typical form frequently occur in the field, as for instance—

1. Investing a fortress. Examples—Investments of Metz and Paris in 1870-71.
2. Covering a siege or investment. Examples—Von Werder's battles on the Lisaine, 14th and 15th January, 1871; Covering the Siege of Belfort. Don Carlos at Somorrostro March and May, 1874, covering the Siege of Bilbao.
3. Covering a base of operations while waiting for reinforcements. Example—Wellington at Torres Vedras.

Active defence.

Of Active Defence the type is to be found in most great battles, one side or the other attacking whilst the other defends. It implies some approach at least to equality between the contending forces; but he who deems himself, from some cause, the weaker, endeavours to draw all the aid possible from defensive tactics in the earlier stages of the battle, waiting his opportunity to return the blow, when his adversary has been weakened by his efforts.

Selection of positions with reference to enemy.

In all cases certain points should be attended to in the selection of a defensive position.

a. With reference to the Enemy.

1. That he should not have good Artillery positions, particularly opposite to the weaker and more important parts of the line, such as the flanks or the important roads traversing it.
2. Nor convenient cover to protect the advance of his infantry and to hide their movements.
3. Nor good defensive positions to resist counter-attack, if that be intended.
4. Nor facilities for moving troops, especially cavalry, unseen, to operate on your communications.

Of these, the 1st and 3rd are most important, if there be time for preparation, because the 2nd and 4th can generally be arranged by a certain amount of labour.

With reference to the defenders.

b. With reference to the Defenders.

1. A clear field for fire, and a command of view over the country in front and on the flanks.
2. Good Artillery positions in rear of the infantry line, particularly opposite those which are available for the enemy, or taking them in flank and commanding the approaches.

3. Good cover for supports and reserves.
4. Extent suited to the numbers of the defenders.
5. Security for the flanks.
6. Free and covered communications throughout the position.
7. Facilities for counter-attack, if it be contemplated.
8. Facilities for creating strong points and for protecting the whole or parts of the line by obstacles, according to the circumstances of the case.
9. A second position, to aid in recovering any part of the main position which may be lost, or to cover a retreat.

All these advantages not to be expected.

That all these advantages are to be found in any position is not to be expected, and the special circumstances of the case will always have to be considered before deciding whether a particular position is suitable to a particular case; but a clear field of view and for fire is now so essential, that if it does not exist or cannot be made within the time and with the means at one's disposal, a position can rarely be tenable.

Clear field of view, essential.

Relation between troops and extent of position.

The relation between the extent of the position and the number of troops required to hold it, has been fully discussed by Colonel Hamley, in his "Operations of War," where he shews that from 4,000 to 5,000 men to the mile is the greatest number that can now be employed in purely local defence. If the position be fortified, this number may frequently be reduced to 2,500, or even as low as 1,500 men to the mile, under very favourable circumstances to the defence, such as strong works constructed on a good position and a large proportion of Artillery. On the cther hand, inferior troops may render it essential to have stronger local reserves, in order that the front line may be frequently renewed during the course of the action.

Clausewitz, ideal position,

Clausewitz, who looks on active defence as the "strongest form of war, in order the more certainly to conquer the enemy," considers great depth of the position as essential, with freedom of movement in all directions unseen by the enemy, and facilities for fighting to either flank, as well as to the front. In such a position he conceives that the defender has great advantages—that he can allow the enemy to penetrate to a certain distance into the position, opposing him only by a small part of his force and making him suffer heavily, and reserving a large part for offensive returns, which can be made with swiftness and by surprise, owing to the natural advantages of his position, which allow him to observe his enemy's movements while his own are concealed.

and ideal defence.

Such tactics now inapplicable, as shown by the War of 1870-71.

Such a mode of action, however, appears more suited to the shock tactics and the short-ranging, slow-firing weapons of the days in which Clausewitz wrote, than to the fire tactics of the present day. Examples of the danger of such a mode of defence in the present day seem to be offered by the battles of Spicheren and Wörth, as will be shown when considering the question of offensive returns. It must be remarked, too, that unless the position be very extensive, and consequently the number of troops be very considerable, the converging fire of a surrounding attack, with modern long-ranging fire-arms, would take effect towards the centre and so vitiate the defence.

Moreover, such defensive positions, even if desirable, are rarely to be found in nature. Probably it was Clausewitz's typical idea which inspired the Austrians in the creation of their famous Quadrilateral of Fortresses in Lombardy, now become useless, owing to political changes.

Deep positions rarely to be found.

Austrian Quadrilateral.

The general idea, then, of a good modern position seems to correspond very much with that which is created artificially in a good modern fortress, except that the obstacle of the main ditch is intermitted or omitted altogether, and that direct defence takes the precedence of flank defence, viz.: a general line as straight as possible, without pronounced salients, which must always be weak. A rampart for Artillery and to cover reserves; a covered way and glacis in front for the fighting line of infantry and their supports; outworks to look into ground unseen from the main line, to retard the enemy's approach, to flank the front, and to facilitate offensive returns; a rallying position as a reduit in rear; flanks secured in one of the modes discussed in the chapter on that subject.

General idea of good position.

If the battle be purely defensive, then an obstacle, such as a river in front, will be of great value, reducing the action to the defence of the defiles formed by the great roads and bridges. But if it be defensive-offensive, with the main object of beating the enemy, then an obstacle covering the whole front will be disadvantageous, as it will make it too difficult for the enemy to attack you or for your counter attack; but an obstacle covering part of the position may be

Obstacle covering the front.

useful, particularly if it can be concealed until the enemy has committed himself to an attack.

Forethought necessary in selecting and occupying a position.

In selecting and occupying a position, it is essential to have perfectly clear views as to the object of the fight, and to make corresponding arrangements, and also to consider well all the possible modes of attack open to the enemy, particularly where he can place his Artillery, how he can bring up his Infantry under cover, and how he can act on the flanks, in order that the best counter dispositions may be determined on before-hand and may be executed promptly.

CHAP. II.

ON OFFENSIVE RETURNS.

Offensive returns may be made in any of the following ways by an army acting primarily on the defensive:—

Various modes of making offensive returns.

No. 1. A local offensive movement out of the position directly to the front made by the troops of the first line, and either

- *a.* At the moment when the assailant is about to make his final rush, in order to avert this danger;
- *b.* Or when he has begun to waver and fall back overpowered and demoralised by the fire of the defenders, and in order to complete and accelerate the repulse;
- *c.* Or to take advantage of any temporary confusion caused by mistakes on the part of the enemy.

No. 2. A local flank attack outside the position by the special outer reserve of the troops holding the part of the line attacked, and made under any of the circumstances enumerated under No. 1.

No. 3. A local counter-attack inside the position, by the special inner reserve* of the troops holding the part of the line attacked, immediately after the enemy has gained a footing within the position, with the object of destroying, or expelling, or taking prisoners the hostile troops who have gained this advantage.

No. 4. A general counter-attack inside the position, made by the general reserves on an enemy, after he has penetrated the first line of defence, and while he is still in confusion, owing to his success. The line of battle being arranged with this object, opposing but slight resistance to the enemy at first, and thus drawing him into the meshes of the net with the object of falling upon him by surprise, and in a manner "quick, concentrated, and energetic."

---

*The terms "inner reserve" and "outer reserve" are used by German Military Writers with the following significations:—

"Inner reserve"—a body of troops whose duty it is to aid those in advance of them in case of their defeat, either by holding passively a second line, or reduit, to cover their retreat and form a barrier to the further progress of the enemy, or by making a counter attack on the enemy *after* he has broken the first line.

"Outer reserve"—a body of troops whose duty it is to aid the garrison of a tactical point, by preventing the enemy from turning or surrounding it, or by attacking him *before* he has assaulted or after he is repulsed.

The terms were originally applied to the defence of a fortified line of detached works—the inner reserves either garrisoning the "keeps' of the works, or being held in readiness inside them near the gorge to fall upon an enemy who might have forced an entrance into any one of them. The outer reserves defending the spaces between the works, either passively, to prevent an enemy passing between them and making a concentric attack on one of the works; or actively, to aid in repelling an attack and to follow up a successful repulse. Evidently the garrison and its inner reserve are under the same command, but the outer reserve forms usually a separate command.

No. 5. A general offensive movement outside the position by the general reserve, and supported, it may be, by the whole Army after the original assailant has expended his force in unsuccessful attacks.

Necessity for offensive returns to insure victory.

Of these various forms of offensive return, which is most to be recommended? Or is it indeed essential to success in a defensive action that offensive movement should be undertaken at all? That it is essential to a decisive victory is the verdict of all the great authorities on the subject. An army, acting strictly on the defensive, may, and ought always to inflict much greater losses on its assailant than those which it suffers itself; but, even should the assailant fail in his attack, if he is allowed to retreat unmolested, he will recover his demoralization, repair his losses, and live to fight again another day; while if attacked and pursued energetically before he has had time to recover from his defeat he will probably be destroyed. Unfortunately for the defending army, their losses, *in proportion to their numbers*, will often be too heavy, and the exhaustion of the whole force too great, to enable them to attack or pursue energetically; but if the advantages of their position are such as to enable them to hold the position against all attacks, and still to keep a strong reserve out of the fight, fresh and ready, to act offensively when the time comes, the victory ought to declare itself decisively for the defence.

This general rule is universally admitted, but the moot points are, when and how should this return blow be delivered.—Ought it to be in part, or wholly, local during the progress of the fight as opportunity offers, and made according to the 1st, 2nd, or 3rd manner mentioned above; should the enemy designedly be allowed to penetrate into the position and then be attacked as under No. 4; or, should it be the final act of the drama, as described under No. 5?

How should the return blow be delivered.

The only modern military writer who has treated this subject fully is Von Scherff, and his bias is so unmistakeably on the side of the offensive and the frontal attack, "pur et simple," that we must not accept his conclusions without weighing them well.

Von Scherff's views.

They are in brief as follows—p. 143.

1. Concentration of the defence on the decisive points of the position, the intermediate ground being only observed.
2. Division of labour.—A part of the troops, and as small a part as will by any means suffice (about one-third), to be employed to hold the decisive points passively—the remaining two-thirds to attack as opportunity offers.
3. The opportunities are—just as the enemy is advancing to storm the position, the attack to be delivered on his flank—or, immediately after he has forced his way in. Only when he makes gross mistakes should the attack be made before the fire of the defence has had full effect.
4. The counter-attack to be quick, concentrated, energetic.
5. The troops of the counter-attack to be concealed close behind a flank, or (p. 140) between two of the main points of occupation, or (p. 132)

when large armies are in question, sometimes in 3rd line behind a flank.

6. The transition from defence to attack is so difficult that the defensive-offensive ought only to be tried by a very good general commanding very good troops.

Criticism on Von Scherff's views.

The whole question of the defensive-offensive is so bound up with the manner of occupying the position, that we must first consider whether "concentration "of defence on the decisive points, only observing the "intermediate ground," is right in principle; we will not quarrel for the present with Von Scherff's conclusion that these decisive points, if properly selected (on the enemy's main lines of advance) and sufficiently strongly held, will infallibly attract his attack, although it evidently would be possible for an enemy to feign an attack on two adjacent decisive points, if the interval were considerable, and, while engaging them with sufficient forces, to push his main body in between them, and so turn them both. But assuming that this might be considered dangerous in view of a possible counter-attack by the reserves, we notice at p. 115 his own deduction from this mode of occupation of the ground, viz.: "the advanced troops "of the attack have, thanks to superior numbers "and greater extent of front, *spread round the* "*flanks* and brought a concentric fire to bear upon "the first line of the defence, reducing it to silence; "they then break in with their masses," &c., &c., and supposing the defence to concentrate on decisive points and only to observe the intermediate parts of the position, this would inevitably be the result.

It is clear, however, that the defence should never concede this advantage to the attack. In those parts of the position where decisive points exist with open ground fit for the movement of troops between and in front of them, these points should be strongly occupied and fortified, the intermediate spaces being left open: but instead of merely observing these intermediate spaces, sufficiently strong outer reserves should be posted there to prevent any such spreading round the flanks of the decisive points, either by fire from shelter trenches or by counter-attacks on *their* flanks. This mode of occupation comes, in fact, to the old idea of lines of enclosed works with intervals, similar to the lines of Torres Vedras, except that, instead of redoubts, the tactical points are hills, woods, villages or such like, fortified as far as time permits, and occupied strongly in *depth*, although not closed in rear, and that the intervals are much greater, in consequence of the greater range and destructiveness of modern weapons, the greater masses of troops brought into the field, and the more extended order in which they must fight. But it always was a principle, that any one of such works, left to itself, must succumb to a concentric attack, and that therefore, supporting troops in the open, to defend the intervals, were essential.

Must be modified.

Then practically a line of enclosed works with intervals.

It must also be observed that this character of defence is only suitable to open country, with occasional villages, homesteads, small woods, or knolls, which give cover and may be fortified. In a close country a continued line, more or less complete, is essential to prevent the enemy from breaking through by surprise. And thus we arrive at the principle generally recognized that, in most selected battle-fields, there are

Only applicable to open country with existing tactical points.

A more continued line essential in other cases.

Hence generally offensive and defensive portions.

parts where the defence must be purely passive, and other parts where it may with advantage be active.

In the defensive part of the field cover and obstacles are improved, or provided, to enable the minimum of men to withstand the attack and prevent the enemy from advancing. In the offensive portions, cover only is sought for in general, but fortifications are used to secure decisive points, to support the passive defence of this part of the field, and to form rallying points, in case of the failure of offensive movements; and here, generally speaking, the main body of the defensive army must be concentrated, both to resist attack, and to make the counter-attack; the line of battle with its supports and special reserves performing the first of these duties, while the latter is undertaken at the right moment by the general reserve.

These considerations lead to the conclusion that it rarely will be possible to maintain the position chosen with so small a fraction (one-third) of the defensive army as Von Scherff proposes, or to reserve so large a portion (two-thirds) for purely offensive purposes, unless indeed the position has very peculiar and unusual advantages.

The principle which he lays down, with regard to the general distribution of the troops in defence, is no doubt sound, viz.: that they should be massed to bar the principal lines, by which the enemy must operate, whenever these lines can be clearly foreseen.

In a country like England, however, where roads are very numerous, or like the great battle-fields of Vionville and Gravelotte in the war of 1870-71, where there are no fences, and troops can move freely in all directions, or in forest warfare as in America, the lines by which the enemy may attack are so numerous, that a pretty equal distribution of troops must be made along the whole line taken up.

Cases in which concentration on decisive points is right.

In countries where the roads are few, and troops cannot manœuvre freely in the intervening spaces, owing to natural obstacles; concentration on decisive points is clearly right, and an example is to be found in Von Werder's occupation of his position on the Lisaine. The impassable nature of the forests which covered a large portion of his front and broke up his position into distinct portions, enabled him to make Montbeliard and Hericourt the main points of his defence, barring as they did the two direct roads to Belfort.

It must be remarked also that when this position was selected and first occupied, this peculiarity in its nature was more marked, because the Lisaine formed an impassable obstacle in front of a great part of the line. This advantage was, however, lost to the defence during the battle, owing to the severe frost which made the stream nearly everywhere passable.

With Von Scherff's conclusion as far as it insists on the division of labour, few will now be disposed to quarrel, although exception may be taken to the proportions he assigns to the respective duties of active and passive defence.

Counter-attack by first line inadmissible.

The examples from late years are so numerous in which the attempt of the first line to attack directly to its front proved futile and wasteful of life, that this mode of action may be considered inadmissible. It is interesting, however, to note in connection with this subject, that the fears which have been expressed by many, founded on our experience with recruits at Sebastopol, that the use of shelter trenches would destroy the *élan* of the troops have proved groundless.

Examples showing its futility, and also that troops holding shelter trenches are not disinclined to leave them.

French and Spaniards have alike boldly left their trenches and rushed at their enemies, and alike they have suffered for their temerity, without deriving any advantage from it. As examples, the French advance out of their position on their left at Gravelotte, and the Carlist bayonet attacks on Republican troops endeavouring to storm their trenches, may be cited.

The former of these is so well known, that it need not be enlarged upon; but the following allusion in "Hoffbauer's German Artillery" to the fruitless counter attacks made by the French on their right is pertinent to the question. "The offensive movements of the French in this quarter were partial, and made by the advanced troops without orders."

In a valuable report on the Republican and Carlist Armies in the north of Spain, made by Captain Tulloch, 69th Regiment, after visiting the seat of war, in April, 1874, the following facts are related on the authority of "a gentleman whose accounts, "when checked with collateral information, proved to "be correct." He stated that "on one occasion, he "was present with a Spanish Force attacking some "Carlist trenches, a line regiment was in front, "when it arrived within a certain distance, the "Carlists (a Navarre Battalion) rushed from the "trench with levelled bayonets, the line regiment "broke and ran, the Carlists killing many of them; "behind the line regiment was a battalion of "Cacadores, who allowed the runaways to pass "through their ranks, then closed up and met the

"Carlists with the bayonet also; a regular hand-to-"hand fight of some minutes took place, the Carlists "were driven back, and the position was carried."

There can be no doubt that had the Carlists continued to fire steadily from their trench, they would not have been driven out of it, and the losses of the assailants would have been far greater. On the other hand, had the supporting Cacadores been echeloned behind a flank, instead of being directly in rear of the front line, they would not have been hampered by their retreat, but would have been able to attack the Carlists in flank, and to have obtained an easier and more decisive victory.

It is to be remarked that the ordinary line regiments of the Republican Army are of inferior physique to the Cacadores or to the Navarre Carlist Soldiers.

There is something to be said in favour of these improvised counter-attacks from the point of view of moral effect; but if an attack is properly supported by artillery and by reserves of infantry, such counter-attacks evidently must fail, because the numbers are too small, and the troops so leaving their shelter and ceasing their effective fire, both incur heavier loss themselves and also fail to inflict as much loss on their enemies as they would do if they continued to fire steadily from their shelter.

The first line of the defence must trust to fire only.

It would appear then to be an axiom, that, unless the enemy makes great mistakes and exposes himself to be caught "flagrante delicto," the troops of the first line of the defence must trust to fire and fire only, resisting alike the inclination to retire before apparently overwhelming masses, or to dash out with the bayonet at a wavering attack. Only in case the enemy should really close with the first line and join issue at close quarters, should the conflict assume the type of a melée. Rarely will this occur if the troops are steady and shoot well and quickly—but, as Von Scherff truly observes, it will be really less dangerous to them to fight hand-to-hand, than to attempt to retreat at this stage when they will infallibly be shot down.

Counter-attacks after failure of attacks.

With reference to Von Scherff's 3rd statement, he is so imbued with the idea that an attack *must* succeed, that he only considers two periods which are favorable to counter-attack, viz.: just before the assault, and just after it has succeeded. He leaves out of the question entirely a third period which may be eminently favorable to the purpose, viz.: just after the assault has *failed* when the "outer reserves" may evidently be employed with advantage; particularly Cavalry, which seems to have its best opportunity of useful employment *during* a defensive action, when small bodies can be concealed sufficiently near at hand to sally out on an enemy retreating in confusion after an unsuccessful attack over ground sufficiently open and otherwise suitable for the action of Cavalry.

Must be local and conducted as sorties.

Such counter-attacks must be purely local, producing no doubt their effect in the general result by increasing the losses and demoralization of the assailant, but they cannot be pressed home; they are in fact sorties, the intention of which from the first is to retreat before they come within the power of the reserves of the attack.

The counter-attacks, recommended by Von Scherff just before the assault, or just after it has succeeded, may very advantageously be made by the special reserves, as mentioned under the heads 2 and 3 at the beginning of this chapter, and with the odds in their favour which he fully explains. But it would appear from his chapter on the Defensive-Offensive that he contemplates the mode of counter-attack described under the head 4, rather than that under the head 3, *i.e.*, that his main counter-attack, which is to decide the battle, should be made early in the day and *inside* the position, if it cannot be conveniently delivered on the enemy's flank, just before he assaults; and the manner of making the counter-attack he lays down under the 4th head as quick, concentrated, energetic—terms which seem to point to the sudden attack of masses, rather than to the slow and careful attack of lines of skirmishers. This was the mode of action recommended by Clausewitz, and probably well suited to the shock tactics of his day. It was tried, with the results we know, by McMahon at Wörth. He probably hoped to throw back the Germans in confusion on the obstacle they had passed, but the French troops, closely concentrated, could not successfully contend with the enveloping attack of the skirmishers of the assailant. At Spicheren, also, the French counter-attacks made under similar conditions, failed in the same way.

Difficulty of making the main counter-attack in a manner "quick and concentrated."

All Von Scherff's writings show that he would deprecate a repetition of such a mode of attack. Careful preparation and extended order are universally admitted to be essentials to success in attack, and there is no evident reason why the conditions of success should be reversed in counter-attack. It may be said, indeed, that if the counter-attack be made after the fire of the defence has produced its full effect, this fire will constitute the preparation needed. Granting this, however, the necessity for extended order remains; and it is probably the difficulty, which evidently exists, of quickly bringing large bodies of troops from cover and concealment in extended order, to attack the assailants in flank, that has impressed itself on Von Scherff. When large masses of men are to be moved, such as the offensive reserves proposed by him, it is evident that their attack cannot, in these days of extended order, be either quick or concentrated; although the terms may with some propriety be used with reference to the smaller special reserves, whose duty it is to aid the front line in holding its ground, and inflicting loss on the enemy by energetic local action, either inside or outside the position, as circumstances may require; and who gain a comparative force considerably beyond what their actual numbers seem to warrant, because they attack at the right moment, when the enemy is either suffering heavily by fire outside the position, and is also attacked in flank; or when, having forced his way in, he is suffering from the confusion and temporary nervousness consequent upon his attack.

Local counter-attacks by the special reserves may so act.

The following episode, which occurred during the battle of the 15th January, 1870, may be taken as a good example of a local counter-attack *outside* the position. It is extracted from "Die operationen des Korps des Generals Von Werder, 1870-71," by Ludwig Löhlein.

Examples of local counter-attacks.

"The defence of Bethoncourt was assigned to the "Landwehr Battalion Goldap under Major Norman. "Simultaneously with the attack on Montbeliard,

" hostile columns, from three to five battalions, were " also directed on this point. A great part of these " troops were driven back by the fire of the batteries " at La Grange Dame; but from one-and-a-half to " two battalions remained in a forward position, near " the railway embankment. These in turn were " obliged to give way before the effective fire of the " German Infantry. A sortie made by a detachment " of the Goldap Battalion across the Lisaine resulted " in the capture of 53 unwounded prisoners, besides " one officer and 16 men, who remained behind " wounded."

The sortie or counter-attack was not made until fire had produced its full effect, and then apparently by the special reserve, not by the shooting line. Such a counter-attack seems, indeed, as much dictated by motives of humanity, as by a desire for victory, as probably the men so taken prisoners could have been shot. If, however, they were concealed by some fold of the ground near the position, they would form a nucleus for a renewal of the attack, and it would evidently be unwise to leave them there unmolested.

The re-taking of the Village of Chagey, immediately after it had been successfully assaulted by the French in the same battle, is one of the numerous examples of a local counter-attack by the special reserves *inside* the position afforded by the late war.

When should the main counter-attack be made?

When is the right time then, it may be asked, to make the decisive counter attack?

To the writer it appears that it ought, as a general rule, to be towards the close of the battle; it may be on the first day; in great battles, sometimes even on the second day; in special cases, when the primary battle is purely defensive, in order to gain time for the co-operation of another army, it may be later still. But in any case, when the assailant has renewed his efforts again and again, and has failed, and endeavours to draw off his shattered and disheartened troops to reorganise and recruit—then seems to be the opportunity for the "ci-devant" defender to complete his victory, and to turn defeat into utter rout.

General idea of a defensive battle.

A defensive battle, from this point of view, should be very simple in its aim, viz:—to wear out the assailant by patiently enduring and repelling all his attacks and making him suffer as heavily as possible by accurate fire. Should he break the line at any point by a successful local attack—the ground so lost, must be regained *at once* by means of the special reserves, or even by a part of the general reserve, if necessary. When his local attacks fail, special reserves, particularly cavalry, may be employed to increase his losses and confusion; occasionally special reserves may make sorties out of the position to aid in repelling or complete the repulse of a local attack; but the great counter-attack must be made towards the close of the day. It may be on the enemy's flank, by troops detached for the purpose, so as to envelop him between the position and the flank-attack, but the reserves intended for this counter-attack must be moved during the battle, if possible out of sight of the enemy, so as to make their attack a surprise, and a general may often hesitate before he loses his hold on a large part of his force, and determines for a time to maintain his position with the remainder at all hazards in hope of obtaining a decisive victory in the end. The troops so detached for the flank-

Different modes of making the final counter-attack.

attack are also in the somewhat critical position of exposing their outer-flank to the enemy.

Local and strategical considerations, together with the evident tactical advantage obtained by this mode of action, may however lead to its adoption in some cases, as suggested by Col. Hamley in his "Operations of War," with special reference to the French at Gravelotte. In others, the form of counter-attack recommended by Clausewitz, so far altered as to be outside the position, may suit the conditions better, viz.:—that in which the offensive return is made from the centre of the position, straight at the enemy's centre. The result of such a blow, if successful, will, as Clausewitz points out, be very decisive; throwing the fractions of the beaten army on divergent lines of retreat.

This counter-attack has also the recommendation of simplicity in execution, of support from the troops occupying the position in case of failure, and of preparation by a convergent fire of all the batteries in the line of battle that can be brought to bear on the point of attack; and whenever the form of the ground is suitable and other considerations do not proscribe it, it would seem preferable to an attack from either flank. But whether the final offensive return be convergent, or by an advance from a flank, or from the centre, or by any combination of these, it must be carried out in every particular with the preparation and the precautions necessary for a primary attack, from which it only differs, in that the enemy has lost heavily and is fatigued and disheartened. His losses ought to be much greater than those of the defending army; from the nature of the engagement, the troops of the latter ought to be fresher; and if the defensive position is well selected, the attacking army will not have a good position in which to receive the counter-attack.

The objection to this form of the offensive-defensive as pointed out by Von Scherff, is, that it is not undertaken at the right moment. He maintains that it is one thing to shatter the offensive power of an army, quite another to destroy its defensive capabilities. That the extreme tension of the nerves, to which men are subject while under hot fire, and which makes them liable to panic if suddenly attacked in flank, the nervous reaction after the immediate danger is over, and the confusion in which the companies and battalions find themselves when they have carried a position, all soon pass away, and if these favourable moments are not taken advantage of at once by the defence, their opportunity is lost, and that although troops repulsed in an attack are not generally fit to undertake it again very soon, they may be quite able to defend themselves.

The disadvantages of these modes of counter-attack.

All this may be admitted, although probably it is only true of very good troops—yet the difficulties of making the counter-attack *quickly* on a large scale, and under favourable conditions, seem to point out the proper method of making the most of these favourable opportunities to be ordinarily by the employment of the special reserves, which may reap the full benefit from the situation on a small scale at different points of the battle-field, and so prepare for the counter-attack on a large scale, which is to win the victory.

How diminished.

Offensive returns in small combats.

When comparatively small bodies of troops come into collision, evidently the local counter-attack may produce the final result, because it may be relatively strong.

Positions unsuited for offensive returns.

A position, or a part of a position, in front of which there is an obstacle or cover giving strong defensive ground to the attack, can never be a proper field for offensive returns outside the position, and ought not to be prepared with this object. The defence here should be passive, and counter-attacks, if ever made, should be by special reserves inside the position, against an assailant who may have forced an entrance at any point.

CHAP. III.

ON THE USE OF ARTILLERY IN ATTACK AND DEFENCE OF POSITIONS.

Primary object of attacking artillery.

In the attack of a position, since infantry cannot with any hope of success attack in front unshaken infantry well posted, the primary object of the attacking artillery will be to prepare the way for the attacking infantry by concentrating fire on that part of the enemy's line where an attack seems most likely to succeed, or where a successful attack will produce the most decisive results. Probably two or more such points within supporting distance of one another will be selected by the attacking general, to be assailed either simultaneously or in succession, as the case may be.

If only one point be selected for the principal attack, minor or false attacks will doubtless also be made to distract the attention of the defenders. On each of these points, artillery fire of greater or lesser weight must be concentrated.

Primary object of defending artillery.

But, inasmuch as the defending infantry ought to be able to resist any purely infantry attack unsupported by artillery, while the combination of the power of the two arms will probably prevail in overcoming their resistance, it evidently will be best for the defending artillery to concentrate its fire on the attacking artillery, in order to save its own infantry from this combined attack. The attacking artillery thus finding itself the target for the concentrated fire of the defenders' guns, will inevitably be drawn into an artillery duel, which, in all ordinary cases, is the first phase in the attack of a position. In this duel the artillery of the defence ought to have the advantage, gun for gun, because presumably they have better positions, and are entrenched; they know the ranges, and have considered beforehand the positions which the attacking artillery *must* occupy, and are therefore prepared to concentrate an effective fire upon them as soon as they appear, and while unlimbering.

Result—an artillery duel.

Advantages to the defence.

How compensated in attack.

Hence, in the attack, superior numbers—and, if possible, surprise—must compensate for these advantages of the defence.

On both sides, however, it must be borne in mind that the real decision rests with the infantry, and should the assailant endeavour to push forward his infantry masses under cover of his artillery fire directed on the artillery of the defence, the latter must at once turn their full power on the attacking infantry, regardless of their own losses from the enemy's artillery. It was thus that the German Artillery acted under Von Werder when, during three days in January, 1871, they resisted Bourbaki's most strenuous efforts to raise the siege of Belfort. Their losses were

Artillery of defence to prevent advance of masses of infantry.

Example.

very heavy, but the French attacks were invariably repulsed.

Artillery of attack to revert to primary object as soon as possible.

So in the attack, however necessary it may be to keep down the artillery fire of the defence, both to enable the attacking artillery to act and to save its infantry from loss in their advance, it is not until the infantry of the defence has been shaken by artillery fire that the infantry attack can have any good prospect of success.

And support attacking infantry.

This success, if obtained, will probably consist in the capture of one or more tactical points in the enemy's front line. To these points some of the attacking guns should at once be pushed on, both to secure them, and also to aid the infantry in their further progress, but a part should be retained in the first position, or should be moved into any favourable intermediate position, whence it may aid in repulsing counter-attacks, or may support a retreat should it become necessary.

Duty of attacking artillery during advance of infantry to the attack.

During the advance of the infantry to the attack, such of the defenders' artillery as can be brought into action will, no doubt, open fire on their supports and reserves;—to save them, the attacking artillery must concentrate once more on the defenders' guns. It will always be a question to be decided on the spur of the moment, and according to the circumstances of the case, whether the whole of the attacking guns should unite once more in crushing the artillery of the defence, or whether a part should continue to fire on the infantry defenders, as long as they can do so without endangering their own infantry. In most cases the latter would be the better course.

In case of failure of attack.

Should the attack fail, the artillery cover their retreat by firing on whatever arm most endangers them in their retrograde movement, and then, reinforced if possible, renew the cannonade to prepare for a second assault.

In case of successful attack.

In the case of a successful attack, the guns pushed on into the captured part of the enemy's position will often be too close to their infantry, and otherwise be badly placed; but the moral effect of their fire, combined with the probable disorganization of the defenders immediately opposed to them, and the necessity for their co-operation to enable the infantry to complete their victory, justify the step. Generally speaking, the advance of the attacking infantry masks the fire of their supporting artillery when they near the enemy's position, and a forward movement of the latter becomes a necessity. Frequently it will be necessary to bring some guns close up to buildings, &c., to batter in gates or drive out the defenders from points which could not be seen or struck from more distant positions. In such cases, the infantry must keep down the fire of the defenders as far as possible, while the guns are being brought up, and until their fire has prepared the way for the attack.

Duties of artillery of defence.

The tactics of the defence at the beginning of an engagement, in ordinary cases, have been alluded to, viz.:—first, to hinder the attacking artillery from concentrating fire on the defending infantry, by engaging and, if possible, crushing them in detail; secondly, to fire on supports and reserves of the attacking infantry, or even on thick lines of skirmishers, if they can be taken obliquely. This second use of the defenders' artillery may be all that is required of it under some circumstances very favourable for the defence, viz., when no position offers itself for the attacking artillery. This would be the case when the opposing heights are wooded, or when the defenders occupy a range of heights commanding an extensive plain, and the attacking artillery is not sufficiently numerous or bold to encounter the defenders' artillery at such a disadvantage. As the attacking infantry approach the main position, and the attack is clearly developed, the defenders' artillery must concentrate upon them the fire of every available gun, and keep up this fire to the last moment, even should the enemy approach to case-shot range. The ground must be held at any cost. The most effective mode of checking the advance of hostile infantry by artillery fire has been found to be to concentrate fire on some clearly-marked line parallel to the front of the position, which they must cross, such as a road or path, a fence, a stream, a ridge or hollow in the ground, the range of which has been previously ascertained. Even should there be no obstacle on this line, the losses in passing it will be so great and so sudden, that none but the best troops will advance beyond it.

In case of a repulse of the enemy.

Should the enemy's attack be repulsed, the defending artillery pursue them in their retreat by their fire.

In case of a partial success of the enemy.

Should it succeed so far as to pierce the first line at any point, the artillery in second line in that part of the position must continue their fire as above mentioned, when not masked by their own troops, and support the counter-attacks of the special reserves. The guns in the adjoining parts of the position converge their fire on the supports and reserves of the attack, who are striving to pour in through the gap.

Ranges.

The most effective range for modern artillery is about 1,000 yards, at which distance the guns can generally be laid with great accuracy, while the gunners and teams are beyond the effective fire of the enemy's infantry. But as in most cases some advanced posts will be held by the defenders' infantry, the attacking artillery will generally be obliged to open fire at longer ranges, or to fire in the first place on these advanced posts, to aid their infantry in driving them in.*

First position for attacking artillery.

It will rarely be advisable, however, to employ a greater range than 2,500 yards, as beyond this range the accuracy and destructiveness of artillery fire diminishes very rapidly, and 3,000 yards may be looked on as a maximum range for field artillery, though guns unavoidably removed as far as 4,000 or even 5,000 yards from the object may do harm if carefully laid.

Second position for attacking artillery.

Where the features of the ground admit of it, and supposing that the positions occupied by the defenders' artillery and advanced posts of infantry oblige the attacking artillery to open fire at extreme ranges, it will be most desirable that, as soon as the cannonade from the first position has produced such an effect that the attacking infantry can advance and drive in the advanced posts, the guns should be pushed on to a second position, from which they can produce a decisive effect on the main position. This second position should be as near as the guns can be brought, without suffering such losses from the enemy's fire as to destroy their efficiency, viz., from one mile to half-a-mile.

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* The question whether an advanced post can be occupied advantageously will always be influenced by this consideration. If the features of the ground in front of it and behind it are such that the enemy's artillery can fire on it without themselves beidg exposed to the fire of the infantry holding it, or of the supporting artillery, it would be impossible to hold the post if strongly attacked.

Spacing of guns.

In the defence, guns may occasionally be concentrated in *position batteries*, on comparatively restricted sites, the protection afforded by the battery, compensating for the disadvantage of reducing the intervals between the guns. In the attack, however, it will always be very disadvantageous to reduce the nominal interval of 19 or 20 yards between the guns; because the effect of the enemy's fire becomes proportionately more destructive.

Double tier of fire.

Special circumstances, may, however occasionally render such crowding of guns unavoidable, as, for instance, when the only position available for the artillery of the attack is so restricted as to make it impossible to bring a sufficient force of artillery into action, without reducing the intervals. In such cases a double tier of guns may even be employed, as was the case in the attack at Gravelotte, in 1870.

Bringing guns into action.

In bringing artillery into action against a position, it is most essential that the commander should have previously reconnoitered the position, and decided on what points to concentrate his fire, and where he will place his guns: and that officers, provided with range finders, should have determined the ranges before the guns are brought up. As many guns as possible should be brought up at the same time, and they should open fire as rapidly as possible, so as to avoid the danger of being crushed in succession.

Batteries in action to be reinforced, but not relieved.

Both in attack and in defence it is a rule that as long as any guns remain effective in a battery, it should continue in action. Partially disabled batteries should be *reinforced*, but *not relieved* by batteries from the reserve, as every gun tells in an artillery contest.

Positions favourable for artillery, with references to slopes of the ground.

Gently falling slope immediately in front of the guns no longer desirable.

The formerly received opinion with regard to an artillery position—" a gently falling slope of not more " than 1 in 15 is to be preferred; the fire of artillery " produces the most effective results on a slope of about " 1 in 100 "—although applicable to the days of smooth-bored artillery, does not now hold good. The meaning of placing artillery at the top of a gently falling slope is, 1st, that the guns being elevated above the plain supposed to exist beyond the foot of the slope, see and take effect upon an enemy advancing over the plain. This advantage is as great now as it was formerly, and, indeed, more marked, inasmuch as artillery ranges are greater; but the gently falling slope conducting from the high level on which the guns are placed, to the low level on which the enemy are supposed to be advancing, has a separate and distinct meaning, viz., that this intermediate ground is to be defended by artillery fire up to the muzzles of the guns.

This was a true advantage in former times, because the effect of artillery fire intensified as the range became shorter, and its maximum effect was produced by case and shot fire, which was superior to any infantry fire at ranges from 300 yards downwards; but breech-loading small arms have reversed these conditions, and have made the case fire of artillery comparatively useless. The effective zone of artillery fire commences now at about 800 to 1,000 yards from the guns, and, as regards the effect of their fire, the slopes of the ground throughout the intermediate distance are of no consequence.

Steep ground immediately in front of the guns advantageous.

There are reasons, however, which make it desirable that the slope should be steep immediately in front of the guns: 1st, because the effect of the enemy's fire will be thereby considerably reduced (as shells falling short will bury themselves instead of the splinters ricocheting, as they would were the guns placed at the top of a gently falling slope); 2nd, because when thus raised decidedly above the ground in front they can fire over the heads of their own infantry with the minimum of annoyance to the latter; 3rd, because the enemy's fire will not be effective at the same time on the advanced line of infantry and the retired line of guns.

Elevated positions good for artillery.

It is further advantageous in the present day that artillery should be placed on hills whence they can see over and into undulations of the ground in front, which would give cover to an enemy were the guns placed at a lower level. The long ranges now necessary and admissible make fire delivered from elevated positions less plunging than formerly when the ranges were shorter, the fall due to the elevated position of the guns being small compared with that resulting from the curve of the trajectory; for instance, guns on a hill 300 feet high, if employed at 600 yards' range, would be firing at a slope of 1 in 6; while if employed at a range of 2,000 yards the fall due to this elevated position would be only 1 in 20. In the former case the trajectory would, however, be almost flat; in the latter the fall would be—say 1 in 10, so that the combined angle of descent due to the elevated position of the guns and the trajectory would be 3 in 20; were the guns firing on level ground, however, the fall due to the trajectory alone would be 2 in 20. Hence we see that the elevated position of the guns has but slightly affected the result at long ranges.

Artillery fire most destructive when trajectory conforms to plane of ground on which the enemy is placed

A projectile "covers more ground in proportion as "its trajectory conforms more to the surface of the "ground;" but this principle does not apply to the case of a gun firing down a glacis slope. The trajectory will be affected so slightly, by firing down a gentle slope, that it need not be taken into account; and the conditions under which fire is delivered down a slope are practically identical with those under which it takes place on a horizontal plane, or up a gentle slope. The angle of descent *with reference to the plane* is the same in all these cases, and the trajectory cannot be said to "conform to the surface of the "ground" more in one than in another.

The fall of the ground *at the end of the trajectory* will, however, materially affect the result, especially if this slope can be seen, and the effects of the fire be noted, which will not often be the case should the *slope "conform to the trajectory,"* as the reverse slope will evidently be hidden by the intervening ground from the battery. It could only be seen from higher ground, or from some nearer point. Hence, it appears that guns on higher ground will produce better effect, should the lower ground within their zone of fire be falling from them (1), than if it were a level plain (2).

As regards the slopes of the ground, artillery positions are thus advantageous for defence:—

Summary of advantageous characteristics of an artillery position as regards slopes of ground and command.

1. When they command all the ground within their range.
2. When the curve of the trajectory of the projectiles conforms approximately to the slopes of the ground they defend, viz., within the zone of from 800 to 3,000 yards' distance.
3. When the slopes immediately in front of them are so steep that the enemy's projectiles will bury themselves, and that the guns can fire over the heads of their own infantry in frontof them.

Ground commanding a plain and not more than 300 feet above it would be suitable as an artillery position. A greater height would make the fire less effective, and if the command were reduced to 100 feet or less it would be more advantageous, unless there were undulations in the plain, seen into from the higher ground but hidden from the lower slopes, when the higher position would be altogether preferable.

Position for artillery attack.

Generally disadvantageous.

For attack, positions less advantageous must frequently be chosen, such as heights opposing those occupied by the defender and either commanded by them, as was the case in the German Artillery positions at Spicheren; or so far removed from them that the guns must be brought down the front slopes, as were the German guns on the heights between Obersdorf and Gorsdorf at the battle of Wörth; or level ground commanded by the heights occupied by the enemy, as the plain to the east of the French position at Weissenburg, where many of the German guns were placed; or the lower slopes of heights so occupied, as in the attack on St. Privat, at the battle of Gravelotte.

In all these cases the attacking artillery is at a disadvantage; but the disadvantage is not in all cases so great as it appears at first sight.

The position on a hill commanded by the enemy's position will be less disadvantageous in proportion as the range is greater and as the reverse slopes are steep. If the range be short, command evidently has more importance, and the rear slopes give protection to teams, limbers and wagons, only in case they are steeper than the curve of the trajectory of the enemy's projectiles. Should this curve conform to the slope, the position will be peculiarly disadvantageous, and it will generally be better to advance the batteries to the front slope, where, although fully exposed to view, the enemy's fire is plunging, and, unless carefully aimed, produces comparatively little effect. Somewhat similar is the position on a plain commanded by the defender's position; worst of all is the position at the foot of the slopes ascending to the enemy, where his fire must produce very destructive effects.

How disadvantages of position may be reduced to a minimum.

Firing up-hill or down-hill.

In all these cases of firing up hill, although the actual trajectory and force of impact are but little affected, yet he who has the commanding position has generally a great advantage both actively and passively. His fire ought to be more effective because he sees his target clearly, and in some of the cases enumerated the trajectory of his projectiles conforms more or less to the surface of the ground on which the target is placed, while his own artillery, withdrawn a little behind the crest, can generally be placed in the desirable position of seeing without being seen, even should artificial cover not have been made for the guns. **In defending a selected position,** the artillery can generally be placed under these most favourable conditions; but in the attack, to see is the great object, and the disadvantage of being also seen must generally be counterbalanced as far as possible by superior numbers of guns and concentration of fire. Sometimes by a movement to a flank so as to bring an oblique fire on the enemy, as was done by the Germans at Spicheren.

How disadvantageous positions in attack may be made the best of.

General idea of an artillery position.

An artillery position, whether for attack or defence, means open ground, sufficiently extensive to deploy the requisite number of guns, accessible to wheeled carriages (*i.e.*, neither wet and swampy, nor steep and rocky, nor thickly wooded, nor encumbered with enclosures) and from which the object to be hit can be seen at ranges between 3,000 and 800 yards.

Choice of artillery positions with reference to objects to be fulfilled, viz., in defence.

In defence, the artillery positions should be so selected as to fulfil their two principal objects, viz.: 1st, to keep the enemy under fire for as long a time as possible, thus forcing an early deployment and inflicting on him as much loss as possible in his approach; 2nd, to prevent him from concentrating a heavy artillery fire on the infantry defending the most vulnerable parts of the position by crushing in detail his batteries as they endeavour to come into action in the positions which it has been foreseen they *must* occupy.

In attack.

In attack, the great object is to break and demoralise the infantry defence at particular parts of the line, in order to prepare the way for the infantry, and then to support them in their advance step by step towards the final consummation.

For defence, then, a certain dispersion of guns is

From which results a certain degree of dispersion in defence.

essential to command all the approaches, and frequently it will be advantageous to support the outposts by artillery, both to help them back and also to oblige the enemy's artillery to come earlier into action, so that it may be known where his main attack will be made, and that preparations may be made to resist it.

But power of rapid concentration to meet enemy's artillery.

To meet the main attack, a concentration of fire on the obligatory points where an enemy must mass his guns, is essential. In certain cases a dispersion of batteries may here be admissible, concerted action being pre-arranged by signal or telegraph, but such cases are of rare occurrence, and the rule is concentration of batteries, for which purpose they must be massed in convenient positions in rear, with good communications to the different points they may be called on to occupy. Roughly speaking, the divisional artillery is dispersed commanding the approaches or flanking parts of the line, the corps artillery massed to oppose the enemy's guns; but frequently both may be combined in concerted action at one part of the field.

Advantages of concentration of guns.

The advantages of concentration of guns, as compared with dispersion of guns and concentration of fire, are twofold—first, that the direction of the fire can be regulated by one responsible officer, and *quickly* changed from time to time as the incidents of the battle may require. If guns are dispersed, orders must be sent by mounted men or telegraph. The former takes too long if distances are considerable, the most important object may have changed before the order is delivered, or it may not be visible from the distant batteries, and telegraphs, either electric or visual, are precarious modes of communication in the line of battle. The former may be interrupted by a shell, the latter become invisible by smoke at the critical moment. Secondly, if three batteries in a concentrated position are opposed by three others dispersed, and having different ranges, as will almost always happen, the concentrated batteries concentrating their fire on the *nearest* of the opposing batteries, will crush it very quickly. They can then concentrate on the nearer of the remaining two with great odds in their favour, being always the stronger, because the three batteries have practically the same range, while the supporting batteries of the enemy have longer ranges than the battery attacked.

Tactics of attack.

For attack, the greatest number of guns available must be employed to force an entrance at the selected point or points. These must be under the command of one officer who directs the fire of the great machine, as a fireman that of his fire engines, to produce the effect required. The target may be changed from time to time according to the various phases of the battle; but "forward" is the watchword of the the attack, as "steady" is that of the defence, and the attacking artillery must always be prepared to advance and "back up" their infantry for whose attack they have prepared the way. Forward movement may oblige them to pass a defile, retreat through which may be very hazardous; but the risk must be encountered and rendered as small as possible by retaining a part of the guns in the first position, to cover the retreat should it become necessary. The tactics of the German artillery at the battle of Worth, may be taken as an example of this.

In defence, artillery not to be placed in front line if it can be avoided, but from 300 to 500 yards in rear of it.

In the defence of a position the guns should not be placed in first line if it can be avoided, because their fire would be silenced by the enemy's skirmishers when they approach within range of small arms, and the enemy's artillery fire, directed on the front line of infantry, would also be effective on the defending artillery. They are best placed on higher ground, from 300 to 500 yards in rear of the front line of infantry. They can then continue their fire over the heads of their infantry, even when the attacking infantry has come to close quarters, they will, themselves, undoubtedly be then exposed to the fire of the assailant's guns, but they can either meet their fire on equal terms as regards range, or, as they almost always ought to do, fire at short range (800 yards) on the now thickened front line of attacking infantry, or on their reserves. In the earlier stage of the engagement, if the enemy's artillery fires on the defender's front line of infantry, his range will be 300 to 500 yards shorter than that of the defender's guns, if they fire at his artillery; but at extreme ranges, little harm is done, and the defender, knowing the range, ought to do more harm to the attacking artillery in the open at 3,000 yards' range, than the latter will do to the defending infantry under cover at 2,500 yards' range.

Reasons for and against this arrangement.

Difficulty of employing artillery in perfectly level plains.

Should the ground be perfectly level, artillery is placed at a great disadvantage. In front line, it is certain to be overpowered by infantry. It cannot *see* the enemy if it attempts to fire over the front line, although the curve of the trajectory might make it safe to do so. Intervals in the front line, and artillery in second line, firing through these intervals, and on

Suggested mode of employing artillery in such cases.

the flanks appears the only permissible arrangement in such a case.

Position of artillery with reference to salient and re-entering angles.

In the very usual case of a position being taken up on commanding ground broken by spurs jutting out to the front, and valleys running inwards, the artillery may often with advantage be placed in the re-entrants at the heads of the valleys, the infantry defending the spurs, and also forming a front line lower down the valley if necessary; but should the indentations be so marked that the lateral range of the guns would be much restricted by such a position, they must occupy the crests of the spurs, the infantry line being placed lower down to defend the under-features. In ground such as that to be found on the Surrey hills, where the under-features are marked and complicated, this will almost always be the best arrangement.

And under-features.

It frequently happens that a bold hill in an advanced position is so advantageous a position for artillery, that it must evidently be occupied by that arm. In such a case the infantry line will be a little way down the slope in front of the guns, generally at the top of the steepest slope, the guns retired so far from the crest that they can neither see nor be seen by the enemy's infantry when they have advanced to within close musketry range, although they will see all the ground beyond that zone, and, therefore, will be able to fire on the attacking infantry as they approach the position, and on supports and reserves.

Artillery in first line on a steep hill.

Whenever artillery is used for flanking parts of the front of a position, or for supporting an advanced post by fire directed on the ground to the right and left of it, care must be taken that this flanking or

Artillery used for flanking, dangerous to defenders.

supporting fire is not injurious to the defenders. The two rules to be observed are:—First, *to give a definite line for the guns to enfilade, within which they are on no account to fire.*

How to reduce danger to a minimum, by enfilading a line sufficiently removed from the troops,

This should, if possible, be an obstacle, but it must in any case be clearly defined; a road, a railway, a fence, a ridge, or line of depression may answer the purpose; and it should be *at least* 100 yards from the defenders, if the range be from 1,000 to 1,500 yards, and the length of the line to be flanked be not more than 400 or 500 yards. If the range be greater, and the length of line to be flanked be also greater, the accuracy of fire diminishes and the spread of the bullets increases, and the safe limit of distance must be increased correspondingly.

and by using only Shrapnel.

Second, *to restrict the fire to shrapnel*; because with this projectile the spread of the bullets and fragments does not exceed one-sixth on each side of the line of fire, that is to say, that at 300 yards beyond the point where the shell bursts the width of the base of the cone of dispersion is 100 yards, while the lateral spread of the fragments of common shell is irregular, and is often very considerable. The premature bursting of shrapnel shells would endanger the troops in the line flanked, notwithstanding the above precautions, and it is probable that for perfect safety the line flanked by artillery should be about 600 yards in front of the infantry, or at the limit of their effective fire. Gatling guns are in every way preferable for flanking purposes, on account of the continuous nature of the fire and the small dispersion of the bullets.

Danger from premature bursts.

Gatling guns to be preferred.

CHAP. IV.

ON THE SECURITY OF FLANKS.

The natural features of a country generally make it incumbent on a General acting on the defensive, to occupy a position partaking more or less of the character of a straight line, such as one side of a valley, or the edge of a plateau, at right angles to the direction of the adversary's march, and compelling him therefore to deploy and form an opposing line previous to attacking. In this usual case, the question always arises, how are the flanks to be secured from a turning movement? Four courses are generally open to the defender, viz: either 1.—To hold a strong point in advance of the threatened flank, or 2.—To secure that flank by troops and guns in echelon behind the general line; or 3.—To hold positions both in advance and in rear of the main line, on the flank; or 4.—To mass strong reserves in rear of the threatened flank, by means of which the line may be extended, or a counter-attack be made. The features of the ground may frequently decide a commander as to which of these alternatives he will adopt, but it seems decidedly preferable in ordinary cases to hold a strong advanced post on the flank. It should be well supported by artillery from the main position, and the ground between it and the main position should be sufficiently open to allow of the free movement of troops, while it also gives sufficient cover to

Position forming one straight line.

Modes of securing flanks.

Advanced post on flank.

supports moving out to the advanced post, or to the garrison of the post when forced to retreat.

Its advantages.

The obvious advantage of such a post, while it is held, in regard to any attempted flank attack of the enemy on the main position, is the support it gives to the outer flank of a counter-attack of the defenders against the enemy's troops moving round past the advanced post to reach the flank of the position. Were no such advanced post held, the counter attack would itself be exposing its outer flank to the main attack of the enemy on the front of the position.

Detached post in front of flank, as at Chenebier.

In many cases also the advanced post will hold the main roads by which the turning movement of the enemy must be made, and thus it will be a necessity for him first to take this post. Of this character was the village of Chenebier, held by General Von Werder, in advance of the right flank of his position on the Lisaine, covering the Siege of Belfort, in the War of 1870-71. Chenebier was too distant from the main position to be aided by artillery placed in it, and therefore a small force, complete in the three arms, was detached there.

The artillery positions at the disposal of the French for the attack of Chenebier were, however, so extensive that the small advanced force, being itself outflanked and liable to be enveloped, was obliged to retire fighting, but it so well fulfilled its mission, that night fell before the French came in view of Frahier and the main position on the Lisaine, which stream they never crossed. A counter-attack in the early dawn, made by fresh troops, collected and brought up during the night, regained for the Germans, in part at least, the ground they had lost, and obliged the

French either to commence their work afresh or to abandon the effort. Circumstances forced them to choose the latter alternative. This is a good example of the advantage which may be derived from such a position when skilfully used. A delaying action fought there may be so prolonged that the enemy's turning movement may be paralyzed and the day wasted in gaining the point from which that movement may be commenced. The time so gained may be of immense importance to a defender.

Advanced post in front of flank, Ste. Marie Aux Chênes.

An example of an advanced post on a flank, within cannon range of the main position is that of Ste. Marie aux Chênes at the battle of Gravelotte. This village, held in advance of the right flank of the French position, obliged the Germans to attack and take it before the Saxons could execute their turning movement, which decided the day. The post was a weak one—Being thoroughly commanded by the ridge of hills in front of it, where the German line of guns was placed, and the Chaussée leading from it to St. Privat, was so exposed to the German fire, that the retreat (if performed along that road) must have been attended with very heavy loss.

Retired position in echelon behind a flank. Amanvilliers.

The same portion of the same battle field gives also an example of the retired position on a flank. As soon as Ste. Marie aux Chênes was lost, Marshal Canrobert collected his reserve Artillery, supported by Infantry, on the hill above Amanvilliers in rear of St. Privat; the occupation of this retired position secured his right flank, and supported the retreat from St. Privat.

From these examples, and a consideration of the subject, we may deduce the following general rules:—

General rules for securing flank from turning movement.

In a close country.

1. In a difficult country, where there are few roads (such as that near Belfort), the flank of an extensive position is best secured by holding a small detached position some distance (two to four miles) in advance of it, guarding the roads by which a turning movement may be made. Information of any wider movement of the enemy being secured by cavalry still further advanced and extended beyond the flank. The resistance at this point should be as prolonged as possible, and it should be aided by field fortifications; but in all probability a retreat must eventually be made to the main position. If this can be deferred until near dusk, the losses in retreat will be less, and there will be a better chance of recovering the lost ground by a counter-attack at night, because the enemy will have had less time for entrenching himself. In such a counter-attack at night the local knowledge of the defenders ought always to give them a superiority.

In an open country.

2. In an open country this detached position would be exposed to be surrounded and the defenders cut off; it will be best then to hold an advanced position not more than a mile in front of the exposed flank, and also, for additional security, a second position retired in echelon in rear of the flank, if the features of the ground are such that the whole position is not vitiated by the loss of high ground on which one flank rests. In this case, not only the wing, but the whole line must fall back if the supporting point of one flank be lost. The modes of using fortifications to strengthen this flank are, either a succession of defensive lines in front of it, or a concentration of defences upon it, according to circumstances; but

strong reserves to act offensively on the assailant outside the position are the true source of strength to a flank in such a case.

The advanced position would be held by infantry. Light artillery should only be placed there in the first instance to bring the enemy under fire as early as possible; but the guns should be retired to the main position when the enemy's attack is fully developed.

The retired position, on the other hand, should be armed with heavy guns, to act on the enemy's flank, when attempting to turn the position.

Selection of advanced posts,

The advanced position will certainly be attacked by a heavy concentrated fire of artillery. It should therefore be chosen and prepared with reference to this—Exposed buildings are evidently unsuitable. A detached knoll or a small wood, or a village protected by folds of the ground or by trees from artillery fire are points which might be advantageously held if found in the right position. In a perfectly open plain, having no natural points suitable for the purpose, the movements of an enemy will be so well seen that there will be ample time to make fresh dispositions to meet them and advanced positions on the flanks would be difficult to support or to retire from. The case of a defensive action in an extensive open plain need hardly be considered, the weaker force must inevitably be outflanked, and no fortifications can prevent this result.

Case of perfectly open plain.

Considerations on selection of position with reference to security of flanks.

In a position such as we have been considering, partaking somewhat of the character of a straight line, we have hitherto supposed that both flanks were liable to be turned. It will evidently be immensely to the advantage of the defender if one or both of his flanks can be made secure from such a danger.

Circular positions.

The cases in which both flanks can be secured are those in which they both rest on impassable obstacles such as arms of the sea; or where the line is a circle facing inwards, as in investments, or outwards, as in entrenched camps. In the former of these, special care must be taken that the obstacle is so wide that the enemy's artillery cannot reach across it with their fire, as that of the Prussians did in their attack on the Danish entrenchment at Duppel. The lines of Torres Vedras were a good example of this class.

Flanks resting on obstacles.

Space between obstacle and flank.

If the Army on the Defensive is strong and is seeking to beat the enemy rather than to maintain a position, it will be advisable to have a wide space between the flanks and the obstacles to entice an enemy in with the object of forcing him back on the obstacles as suggested by Col. Hamley in his "Operations of War." In the case of a weak force on the defensive, however, this might be a dangerous experiment.

Flank resting on a wood.

A wood on a flank may be a great danger or a great security. It is a great danger if it allows the enemy's infantry to approach the flank under cover, and to debouch from it close to the flank: such was the Gifert Forest at Spicheren, left without any precautions to prevent a flank attack as it was by the French. It might have been a great security if the outer edge had been felled and entangled, and it had been defended by a sufficient force. A wood on a flank may have a very beneficial influence on the defence if it thickly clothes a hill which might otherwise have given the enemy an Artillery position, enfilading the line; such was the Bois de Vaux on the

Spicheren.

left flank of the French position at Gravelotte. The forest on the left of MacMahon's position at Woerth had a similar influence, prohibiting the Bavarians from using their Artillery on that flank.

Gravelotte.

Woerth.

In order that a wood so situated may have its full value to the defender, his flank should not be within musket range of it, and the edge nearest to his position should be obstructed by an entanglement, and should be under Artillery fire to prevent an enemy from debouching from it.

Flank resting on a Fortress.

But the best possible security for a flank is when it rests on a fortress because the fortress has an active as well as a passive influence, and keeps the enemy at a distance by its Artillery.

Metz.

Bazaine's left flank at Gravelotte should have given him no uneasiness, because, had the Germans attempted to push in between his left, on the heights above Jussy and Vaux, and the Moselle, they would have come under the fire of the heavy guns of St. Quentin, and would have been in such a confined position that they ought to have been made prisoners.

French left flank at Gravelotte.

Had the French made an entanglement on the southern slopes of the promontory above Vaux, and placed a few batteries at Jussy and St. Ruffine, they might have been perfectly confident that the 2nd Corps could have held this part of the position against all comers. Even had they lost the Jussy-Vaux promontory, (which seems impossible, if the precautions above-named had been taken) they had the strong position, Point du Jour, Rozerieulles, St. Rufine in rear of them, which they actually held on the evening of the 18th August, 1870. The Germans in their attack on this part of the position could not derive any real assistance from their formidable artillery, on account of the Bois de Vaux, as before-mentioned. One battery was brought along the road from Ars and came into action in a vineyard on the spur below Jussy. Another battery at Orly, on the right bank of the Moselle assisted that at Jussy, but at very long range (over 5,000 yards). Apparently the French had no field artillery on this flank, but the guns of St. Quentin replied to the German field guns with a few large shells at 5,000 yards range, and prevented the latter from pushing closer to the French position.

CHAP. V.

ON DEFENSIVE AND OFFENSIVE FORTIFICATION.

Fortifying positions.

Division of subject into hasty and deliberate fortification.

Hasty fortification, when applicable.

WE may now proceed to consider the best modes of fortifying positions, selected in accordance with the foregoing principles, and intended for either active or passive defence. Two general modes of fortifying are employed in the field, which we may distinguish by the terms "hasty" and "deliberate" fortification. The former is applicable to those cases which are by far the most common in modern warfare, when the time available is about six hours, or part of the day previous to an engagement, and when it is important to employ as few men as possible, so as to give rest to the majority to fit them for the coming struggle.

Deliberate fortification, when applicable.

The latter can only be employed in those rarer cases when the time available is from three days to a fortnight, and labour, either civil or military, is abundant. In a fortnight, indeed, with abundance of labour and good arrangements, works of a semi-permanent character can be constructed, if the sites have been determined, and the designs prepared beforehand; while in three days good enclosed fieldworks cannot generally be constructed unless two or three reliefs of men be employed.

It is only hasty fortification which will here be treated of.

Nature of hasty fortification.

For hasty fortification the time and means allow only of the construction of open works, and, except in very special cases, these are only shelter-trenches and gun pits; occasionally an open work of stronger profile may be constructed at some important point which is liable to be heavily cannonaded; but no enclosed earthworks can be made. The only tactical points capable of standing alone for a time, which can be extemporised, are fortified buildings, or groups of buildings, or enclosures, or small woods. For deliberate fortification, on the other hand, detached enclosed works, provided with field bomb proofs, form the principal element of the defence. These may be sometimes armed with artillery; but more generally the guns are better placed in gun pits or open batteries in rear of the line of redoubts and secured by them from infantry attack. The advanced intermediate works may be either trenches or parapets with ditches, according to circumstances. In both hasty and deliberate fortification the great principles of a clear field of fire, cover for reserves, and good communications must be attended to; but evidently these principles can be more thoroughly carried out in the latter than in the former. In many cases, however, when time permits, hasty fortifications may gradually be improved into deliberate fortification. This will often be the case in investments and similar operations.

Characteristics of deliberate fortification.

Principles of universal application.

Obstacles in hasty fortification.

The obstacles which can be made in hasty fortification are chiefly those obtained by felling trees. In an open country, obstacles can only be attempted at particular points, as on bridges, in villages, or other defiles where barricades may be made; existing obstacles, such as fences, may be improved, particularly in the vicinity of the tactical points; occasionally a partial inundation may be effected by damming up the arches of a bridge, on the up stream side, with the parapet walls thrown down, and timber, earth, &c.; or bridges may be demolished, if not required for offensive movements. In deliberate fortification, all the various well-known military obstacles may be made use of; but in both cases, the use of obstacles must be subservient to the general plan of defence, whether active or passive, just as in deliberate fortification the connecting works between the redoubts, must vary in character according to the circumstances of the case, approaching more nearly to a continued line as the defence is intended to partake of a more passive character.

In deliberate fortification.

Connecting works.

Successive lines of works tactically considered.

Two or more successive lines of works are generally made in fortifying a position, and each of these lines may itself be a compound line in whole or in part.

The three lines usually occupied or prepared are, *the outpost line*, *the main line*, and *the rallying position.* The first of these comprises three parts, the line of sentries, the line of pickets, and the line of supports.

The main line has generally advanced posts in front of it, and usually itself consists of a double line, the first being the principal infantry line, the second partly artillery, partly supports and reserves, and partly a second infantry line occupying intermediate or secondary works. The rallying position may be similarly arranged, but more ordinarily it comprises two general lines—infantry in front—artillery on higher ground in rear; it would only be occupied in case of a reverse.

Outpost line.

The outpost line* is rarely fortified further than to barricade the roads and loop-hole a few walls, &c.

Fortifications.

Of its component parts, the *fighting line*, where fortifications, if any, would be made, is the line of the supports.

Ordinary arrangements.

Ordinarily the positions for the supports of the outposts are so chosen that they command by their fire the ground in front of and between them, and particularly the main roads leading to the positions, and thus oblige an enemy to attack in force before they can be passed or driven in. Natural cover such as fences, woods, villages, or folds of the ground is used to the best advantage, with occasionally a piece of shelter trench, or a wall loop-holed, or a hedge prepared for defence; but connecting obstacles are not generally made, and the type of open works should never be departed from, that is, the men should never be shut up in buildings or enclosures of any kind, as their duty is to retreat fighting.

Special arrangements.

Occasionally the open works for infantry are connected by obstacles which they flank, sufficient openings being left in the obstacles to allow the pickets to retreat. Such a line presupposes that there is no intention to advance through it in force, and it would be applicable therefore only to a passive defence, such, for instance, as an investment, or that part of a line of outposts the country in front of which precludes the intention of offensive movements.

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* For information on this subject see a pamphlet lately published by Col. Hamley, C.B.

Artillery with outposts.

Artillery may sometimes be used in immediate support of outpost lines to command important roads, and assist the outposts in their retreat. The position for the guns would be from a quarter to half a mile in rear of the intervals between the open Infantry works.

Distance between the successive lines.

The distance between the outpost line and the main line, and between that again and the rallying position, may vary between half a mile and a mile, but should never be less than about 600 yards if they are to be defended successively, unless the ground be very steep; because, if the trajectory of the enemy's projectiles in any degree conforms to that of the site defended, artillery fire directed at the front line is effective to about 600 yards in rear of it.* The component parts of each line which come into action at the same time must always be within close Infantry supporting distance—300 to 400 yards.

Distance between parts of each line.

Openings in line, or intervals.

When openings are left between works, or in lines of obstacles, for offensive movements on a large scale, the front of a deployed battalion (300 yards) is the guiding measure. This allows ample space for cavalry or artillery. Hence, in deliberate fortification, the intervals between the capitals of the redoubts in a line may be from 350 to 500 yards, if the ground is to be completely defended by musketry, and bat-

For active defence.

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* Von Scherff says 300 yards, Wagner says 600 yards, the latter appears to be the truer estimate.

talions of infantry, regiments of cavalry, or batteries of artillery, are to be able to move freely in the openings. The intervals may be increased to from 850 to 1,500 yards if the troops are to manœuvre by brigades or divisions, and the defence of the ground is to be by artillery.

For passive defence.

For passive defence the openings would be diminished to the width of roads or paths, and covered by traverses if required.

In no case can it be useful to leave wide openings in that part of a line where the country in front of it is too much enclosed to move troops freely, or where obstacles preclude an advance.

Offensive fortification.

The use of artillery in the attack of positions has been already described, and the infantry operations of the attack are so fully discussed in their probable modern aspect by Von Scherff and other German writers, and by Lieut.-Col. Home, in his Précis of modern tactics, that it is needless to dwell upon this subject except as regards the fortifications appropriate to the attack.

Three cases ordinarily occur in which hasty entrenchments may be of use in the offensive battle, viz.:—

Entrenching the front to aid a turning movement.

1. When a portion or even the whole of the front is entrenched and defended by a small part of the force, the bulk of the army being moved by a flank to turn the enemy's position, tactics frequently adopted during the late American war, and specially favored by the wooded character of the country. The fortifications in this case must evidently be suited to a passive defence, their object being to secure the communications

of the army from a sudden counter-attack made before the turning movement has taken effect.

Securing a point won in the enemy's line.

2. When an important point in the enemy's position has been won, and it is to be secured against counter-attack and used as a base and starting point for further efforts. Under such circumstances, time is all important; well considered and sufficient preparations should be made before the attack, and working parties with the necessary tools should follow closely the supports of the attacking troops, and instantly proceed to execute the necessary works which will be of the simplest character, such as loopholing walls, making banquettes, reversing shelter trenches by throwing the excavated earth to the other side of the trench, making new trenches, felling trees, barricading entrances to buildings or villages on the enemy's side, and improving communications on your own side.

Entrenchments to cover retreat.

3. Entrenchments to cover a possible retreat, and form a rallying point for the beaten troops. These may be made before and during the progress of the attack, and although they will be useless if the attack succeeds, they will be of the greatest service in case of failure.

Offensive fortifications such as those described under 2 and 3 were frequently executed during the war of 1870-71, and were of great value to both French and Germans.

Possible further development of hasty entrenchments.

It is believed by some officers that a still further development of hasty entrenchments will yet be seen, and that infantry soldiers carrying small shovels will always be able to make slight shelter for themselves.

The continental armies are introducing this system; but it remains to be proved whether the extra weight and incumbrance of the tool will not counter-balance its apparent advantages. The experience of the American civil war was so peculiar that it cannot serve as a basis for argument. The theatre of war was so thickly wooded that troops could entrench themselves when in very close proximity to an enemy without being seen or fired upon. In an ordinarily open country, artillery fire would probably prevent the execution of such work in the presence of an enemy.

CHAP. VI.

DETAILS OF HASTY ENTRENCHMENTS.

Colonel Hamley has pointed out in his Operations of War that the front line of infantry is the fighting line, which is not to retreat, but to be fed and supported from the rear, and that this fighting or shooting line should be in single rank at intervals of about one pace. Whenever natural cover does not exist, it will be most important to provide it artificially for the front line by means of shelter trenches.

Shelter trenches.

Shelter trenches should have the ordinary profile, 4 ft wide, 1 ft. 3 in. deep, in all cases at first. This gives cover to a single rank kneeling, with supernumeraries and officers. In the defence of very steep ground the trenches may with advantage be deepened to 3 ft. if time permits, and the defence is of a comparatively passive character; and under similar circumstances in ordinary ground they may be gradually increased in size so as to give cover to men standing.

Profile.

Position. The position of the trench in irregular ground requires careful inspection of the slopes, and can only be decided by kneeling or lying down so as to bring the eye to the level of the parapet of the trench. The *top of the steepest part of the slope* will generally mark the line for the trench.

Trace. Where spurs jut out, the line of trench usually will be broken *en echelon*, as direct fire to the front is what is chiefly wanted, and a flanking trench would be itself enfiladed. In order that the men in the retired echelons may not fire into those in front, the latter should not be extended beyond a line drawn from the extremity of the trench in rear, and forming an angle of 45° with its general direction. The trenches should be traced generally so as to take the shortest line along the general front consistently with obtaining from them a perfect view of the ground, and with avoiding enfilade. In portions of the line where it is intended that cavalry or artillery should issue, shelter trenches should not be made, as the obstacle, though slight, is sufficient to cause disorder. **Openings.** From 100 to 300 yards will generally be a sufficient opening to leave for such a purpose, and if, as is usual, it is in a hollow, it can be efficiently defended by cross fire. A battalion of 800 men usually would have from four to five companies in front line, the remaining four or three in support. **Length of trench for a battalion.** Allowing one man to the pace, the trench for the front line would be from 400 to 500 paces long. It would rarely happen that a continuous line of trench would be required of a greater length than this, because bends in the ground, obstacles, &c., naturally make breaks in the line, and in any case it is better to leave slight intervals between the different tactical units. **Breaks in the line.**

Supports and special reserves can almost always find natural cover; but when this is not the case, it must be made for them by means of shelter trenches in convenient positions, traced, it may be, to suit column formation.

Cover for supports and reserves.

In the defence of steep ground of a form similar to the chalk downs of the south of England, it is often extremely difficult to decide on the best positions for the infantry and artillery. The rounded form of the slopes, gentle near the top, and getting steeper lower down, with a continually varying curve makes it necessary to place infantry at a comparatively low contour of the hills that they may have a good range to the front, and see their enemies at every step of their ascent. In such a position a deep trench is essential, as it must form a good mark for the enemy's artillery. Probably it will be best to give the trench sufficient dimensions to give cover to the support as well as to the shooting line. If the shooting line were placed nearer the top of the slope, the range is limited generally to about 200 yards, owing to the varying curve of the surface of the hills, and the enemy could ascend the steep slopes unopposed by direct fire. Whenever flanking fire can be obtained from neighbouring projections it should of course be used to the utmost; but the rounded contours of the hills make this aid to the direct defence very imperfect. These chalk hills look imposing, and the bodily effort of climbing their steep slopes is considerable; but they are by no means so advantageous for defence as less commanding ground with gentler slopes. Generally it will be found best to place the infantry line at the foot of the steep slopes, where

Defence of very steep ground similar to our chalk escarpments.

fences and woods give cover, and there is a good glacis slope to the front, reserves and artillery being kept on the high ground.

Shelter trenches not to be flanked. In tracing shelter trenches, it should always be borne in mind that they are merely intended to cover infantry, disposed in such a manner as will bring the strongest direct fire on the ground in front, and that as they present no obstacle to infantry, the idea of flanking them is not to be entertained.

Cover for men's heads. Whenever time and means admit, cover for the heads of men using shelter trenches, should be provided, a log supported on a few sods on the top of the parapet, is, perhaps, the simplest and best cover that can be used. The loopholes should always be wide enough to give full lateral range and to enable the men to see their enemy clearly.

Gunpits. Guns posted on high ground, may frequently be well protected by withdrawing them so far from the crest, that they cannot be seen from the low ground in front, within close musketry range. In such cases gun pits are not necessary as regards the enemy's infantry fire; it may, however, still be advisable to make gun pits in order to give protection from artillery fire directed upon them from opposing heights.

German compared with English. The gun pit in use in the German service is simpler than ours, and although not giving such complete protection, it allows of wide lateral range, and it presents a smaller mark. The gun in the German pit fires *en barbette*—in ours through an embrasure—and in most cases in the field, the former is much to be preferred as giving full lateral range to the gun instead of confining it to one direction of fire. For flanking a special line, however, the English type may sometimes be preferable. The German gun pit is 18 feet square in plan, the front part for 12 feet is sunk 1ft. 6in., the remaining 6 feet forms a ramp at a slope of $\frac{1}{4}$. The excavated earth forms a parapet of 1ft. 6in. high and about 12 feet thick, with small epaulements. It can be made by 8 men in an hour.

Supply of ammunition.

A field battery in action without artificial protection is supplied with ammunition from the limbers which, with the teams, are in line about 20 yards in rear of the guns. The limbers and teams take advantage of natural cover as far as possible.

The ammunition wagons from which the limbers are supplied are still further in rear in secure positions.

Protection for ammunition.

When gun pits are made for the guns, arrangements must also be made for protecting the ammunition and ensuring its regular supply. If accidents of ground give cover to the limbers and horses sufficiently near to the guns, nothing further will be required; but should this not be the case, one of the following alternatives must be adopted, viz:—

Recesses for Limber boxes.

1. The limber boxes must be taken off and placed in the gun pits, or in recesses at their sides made for the purpose; the teams and limbers being moved to the rear to some sheltered position until wanted.

Limber pits.

2. The limbers may be left near the guns, protected by limber pits, the teams only being taken to the rear.

Limber trenches.

3. Both limbers and teams may be artificially protected near the guns.

Comparative advantages and details.

The first plan involves very little earthwork, and the gun detachment while serving the gun are saved the labor and exposure of bringing up ammunition;

the objections to the arrangement are the time required for detaching and replacing and securing the boxes on the limber, and the risk of the ammunition being exploded by a shell, or by accident, in the gun pit, amongst the men.

The 2nd plan, very generally adopted by the Germans during the war of 1870-71, requires the labour of about four men for 6 hours for each limber pit which is most easily made in the form of a ramp 6 feet wide at the bottom, sloping $\frac{1}{4}$ towards the enemy and reaching a depth of at least 3 feet below the surface. The side and end slopes are at $\frac{1}{1}$ and the excavated earth forms an epaulement on the side nearest the enemy.

Limbers are normally placed 20 yards directly in rear of their guns when in action; but it would appear advisable to make limber pits ordinarily *between* the gun pits and only slightly retired behind their general line, so as to leave a free passage. They would here be less liable to be hit by projectiles aimed at the guns, and the supply of ammunition would be carried on with less fatigue and exposure.

The objections to the system of limber pits are that with horses possibly restive under fire, there might be delay in hooking in the teams, and that the labor and exposure of the men in supplying ammunition are greater than in the first plan.

The artificial cover required for the third system is a trench 4 feet deep and 8 feet wide, parallel to the line of guns and troops in rear of them; the earth thrown up on the side next the enemy. The limbers and teams file into and out of this trench by means of ramps at the ends. This is the regulation German limber trench, but it does not seem ever to have been used during the war of 1870-71, probably owing to the amount of labor required for its construction, and the obstacle it forms to movements of the guns.

Clearing the ground in front.

The importance of clearing the ground in front of a position, from cover which would conceal or protect an enemy in his advance, has already been alluded to; its importance must always rank higher than that of providing shelter for one's own troops, or than that of making obstacles.

Extent to which it must be carried.

The distance to which the ground should be cleared must depend on the time and means available; but if possible, an enemy should at least be deprived of cover which would enable him to establish an extensive line of infantry within effective small arm range (400 yards minimum) of the position, and this more especially in front of those parts which are otherwise most liable to assault from their saliency, or from the existence of convenient cover for the enemy's reserves, or favourable positions for his artillery.

Alternatives.

Should it not be possible to clear away cover to the extent desired, then obstacles must be formed. In default of obstacles, strong reserves must be posted at such parts of the line—a second position selected in rear—lines of retreat prepared, and arrangements made for immediately attacking the enemy in flank, should he gain a partial success at such points, and for this purpose it may be necessary to make openings in fences, &c., within the position.

Opening ranges for guns.

To open up ranges for artillery in particular directions, gun cotton may often be advantageously employed in felling trees.

Standing corn, or other crops of high growth, may mask an enemy's advance, from men using shelter trenches. This may be obviated by marching men in line over the ground in front of the works previous to the action. If the ground be covered with heather, withered grass, &c., and the weather be hot and dry, it may be set fire to during the action and great confusion and loss result—to avoid this, a belt should be cleared with sickles, &c. in front of the position and the ground on which the troops are to stand, may then be quickly cleared by fire. The ground in front need not be so cleared, fires occurring during the action would be very disadvantageous to the attack. They may be created at will by means of rockets.

How to deal with standing corn, heather, &c.

Obstacles still valuable.

The use of obstacles, although not so important as formerly it was, on account of the increased deadliness of musketry fire, is still a valuable auxiliary in many cases, enabling a weak force to hold ground against an attack which would inevitably overwhelm them were there no obstacles to detain the enemy under fire. Particularly are obstacles useful in close country, where a long range cannot be secured, and the enemy in attacking has only a short distance to traverse under fire, and in the case of night attacks.

To be used with discretion.

Obstacles are evidently only to be used in those parts of a line where offensive movements are not intended, and this question must always be well considered as it will materially aid an attack should an obstacle exist in front of the defender's line, precluding the possibility of a counter-attack. As before observed, the only obstacles that can be created in hasty fortification are entanglements of trees, hedges and fences improved, and small streams formed into partial inundations wherever existing causeways carrying roads across valleys form ready-made dams,

Their nature.

only requiring completion by stopping up the arches of the bridge. A river of any size cannot be dealt with in this way; to dam it is a difficult engineering operation; and if the fall of a stream be considerable and its course rapid, evidently the inundation would be very insignificant, and there would be danger of the dam being carried away by the force of the current. Wire entanglements may also be used in many cases where telegraph lines supply the material or if a proportion of wire be carried with an army, as has been happily suggested by Captain T. Fraser, R.E., the R.E. Gold Medalist of the present year. No. 8 wire, weighing about 400 lbs. to the mile, is the best for the purpose.

Barricades. Roads, streets, and bridges may be hastily barricaded by felled trees, by furniture from houses, or by carts or wagons thrown over on their sides, but the obstacle must be under fire, and must not in itself give cover to an enemy. If no natural cover such as buildings, walls, or fences is suitably placed to secure the defenders of the barricade, it must be made. A row of barrels on end, filled with earth from a trench in rear, having an abatis in front and cover for the men's heads is a good type of defensible barricade. If artillery can be brought to bear on it, earth must be used for the parapet. In almost all cases, a passage should be left through the barricade for advance or retreat of outposts. This may easily be arranged by making it in two parts, overlapping one another like the traverses in a double sap, or by making it at a sharp bend in a road, or where a house slightly retired from the road will guard a passage at one end of the barricade.

Demolition of Bridges.

The demolition of bridges should never be undertaken without due consideration and the special order of the General commanding It will rarely be advisable to destroy a bridge over a fordable stream in front of a position, because it will not stop the infantry attack, but will seriously impede an offensive return should it become desirable. Occasionally, however, it may be of importance to do so, to delay an enemy in placing his artillery in a good position if it can only be reached by crossing the stream or other obstacle such as a deep railway cutting, passable by infantry but not by artillery.

Communications.

The communications inside the position must be ample to allow of retreat should it become necessary, of bringing up reserves quickly, and of moving troops easily and unobserved by the enemy from one part of the position to another. Ramps or small bridges to cross ditches, streams, hollow roads, or embankments, and gaps in fences are the most generally required—causeways across swamps, paths through woods, and bridges over rivers are also sometimes necessary. The pontoon train is specially available for the last.

Redoubts not generally to be used in hasty fortification.

Redoubts as before observed should not be attempted in hasty fortification. The labor and time required for their construction can in almost every case be more profitably employed in clearing the ground, and making shelter trenches and obstacles, and improving communications.

Their use in deliberate fortification.

In cases, however, where hasty fortifications are improved until they assume the character of deliberate fortification, redoubts may be made with great advantage to secure a position for a certain time with a minimum of defenders. They should always be placed, if possible, on comparatively even ground, as they can never be made to defend steep slopes and irregular ground satisfactorily. When unavoidably placed on irregular sites, trenches should be made for their "outer reserves" to defend the steep slopes.

To be placed on even sites.

If otherwise, trenches to defend steep slopes.

Guns or mitrailleurs placed in redoubts for flanking purposes may advantageously be fired through embrasures, and should be well traversed. For direct fire they must be en barbette, and the German system of obtaining the earth for the barbettes from trenches in rear into which the guns can be retired, when the close approach of the enemy makes it better to defend the barbettes by infantry kneeling, is as good a solution of this difficult question as has yet been given. Whenever it is possible, artillery should be kept outside the redoubts and in retired positions.

Embrasures or barbettes.

Field casemates or bombproofs must be provided for the garrisons of redoubts, sufficient to give security from artillery fire to at least two-thirds of them, at the rate of 6 square feet of floor space per man.* They should be arranged so as to allow of the men being moved in or out of them rapidly.

Bomb-proofs.

On the manner in which working parties are to be detailed for the execution of works of hasty fortification, how the tools are to be provided and what should be the chain of responsibility with reference to the general plan and to the details of the works, nothing will be said here; because these all-important points, still unfortunately somewhat undecided in our army, must be settled and laid down by regulations issued by the highest authority.

On working parties, tools, and responsibility for plan and execution of work.

There are so many interests involved in these comparatively new questions, and opinions differ so materially with reference to them, that the wisdom of delaying decision hitherto cannot be doubted. Experience gained in our peace manœuvres will, however, tend very materially to clear away difficulties, and we may now hope that very shortly our new system of tactics both for offence and for defence will be as clearly laid down in every particular as is the German system in the new regulations for that army which has become the European model for completeness of organization.

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*This gives room for standing or sitting; from one-third to one-fourth of the garrison would have room to sleep.

NOTE—Since this chapter was written, a memorandum on Entrenching Positions has been published by authority at Aldershot, with special reference to the Summer Manœuvres of this year. The questions of working parties, tools, and responsibility for plan and execution of work, are all dealt with clearly in this memorandum, which will be found in the Appendix.

CHAP. VII.

ON THE DEFENCE AND ATTACK OF HOUSES.

Buildings may be used for defence under many different circumstances, either singly or in combination with others.

Some of the principal cases in which it may be desirable so to use them are the following:—

1. As tactical points in a battle-field, either as advanced posts, as supporting points *in* the line or on its flank; or as rallying points to cover a retreat.
2. As reduits to a more extensive locality, rendered defensible, such as a village or a wood.
3. As isolated posts on the lines of communication of an army.

Object of defence to be kept in view.

Whatever may be the special object for which the building is fortified, this object must be steadily kept in view in arranging the defences; thus, if it be an advanced post, it will be of little value, unless it can bring a strong fire on the ground on each side of it, so as to hinder an enemy from passing it by; it must also have facilities for receiving reinforcements from the rear. Loopholes therefore, on the front and flanks will be chiefly for offensive fire, while if any are made in rear, they will be generally for defensive (flanking) fire, and care must be taken that fire from them will not endanger the supporting troops. Sometimes when the advanced post is on ground descending towards the enemy, upper windows may be used safely for reverse fire, because from them it will be so plunging as not to ricochet onwards towards the line of supporting troops.

On the other hand, if the house be held as an isolated post, self-defence will be the chief consideration, and it must be prepared for a prolonged defence, and against night attacks. Probably also the command of a wood or bridge or defile must be provided for.

Houses not generally defensible against artillery.

A substantial house can quickly be converted into a redoubt, giving absolute security against cavalry, and very great advantage in a contest with infantry; but unless the walls be very massive, they can readily be breached by field artillery, and the bursting of shells inside the building, combined with the fires probably kindled by them will make the prolonged defence of an ordinary building, subjected to a combined attack of infantry and artillery, almost hopeless. No banking up of earth against the lower parts of the walls will have any effect in preventing shells from setting fire to the building.

Houses are suitable for defence when they are strongly built, of sufficient size, well situated for the object in view, and when from them can be seen all the ground in the vicinity, within musketry range. If liable to attack by field artillery, they are defensible when unusually massive and built of brick or soft stone (in preference to hard stone which splinters), and with low or flat roofs, or when the features of the ground, or woods, or houses screen them from the fire of the enemy's artillery, unless the guns be brought within range of the rifles of the defenders. Hence it will be observed that buildings are better suited for defence when in hollows than when on high ground, because they are sheltered from distant artillery fire, while the height of the walls defilades the defenders from the fire of infantry on the adjoining crests.

Garrison.

The garrison of a house may be estimated at from two men to each opening, to be defended (door, window, or loophole), at least on the ground floor—to one man to each loophole, with a reserve of $\frac{1}{4}$. A strong building may be defended by even a smaller garrison than this, but the actual garrison will depend in some measure on the importance of the post, and it should always, if possible, be a tactical unit.

Attack of houses.

Before describing in detail the mode of fortifying houses, the different ways in which they may be attacked, will be considered—

Infantry by day.

1. *An infantry attack by daylight* would probably be made by advancing skirmishers and gradually strengthening them until they formed a long enveloping line of marksmen lying down, under cover if possible, and concentrating their fire

on the loopholes of the front to be attacked. Protected by their fire, the storming party advances, accompanied by engineers, or a working party, with axes, sledge hammers, gun cotton, or whatever means are available for removing obstacles and forcing an entrance.

The advance would be made over ground on which the defenders' fire was weakest, probably at a salient, and having penetrated the line of obstacles at that point, the assailants would endeavour to extend close to the walls *under* the line of fire of the defenders, and to grapple with and bend their rifles. If flank defence existed, it would be neutralized as far as possible, by a concentrated fire on the loopholes. The entrance would not be attempted at a salient, which would be difficult; but at a door or window, or by breaching the wall with gun cotton.

A tambour might offer an easy access to the interior of the building, if it were low or weakly constructed.

Once inside the building, if the defenders still resist, it should be set on fire.

Two or more attacks should generally be made at the same time to distract the attention of the defenders and to multiply the chance of success.

Infantry at night.

2. *An infantry attack at night* is more likely to succeed than by day, because the approach can be made with little or no loss. It is only while removing the obstacles and endeavouring to force an entrance that the defenders' fire will be effective.

The attack should be made by surprise, as far as possible, and a previous reconnaissance is of great importance to avoid mistakes and confusion in the dark, and to know what provision is suitable to be made for overcoming obstacles. The troops would be assembled secretly as close to the building as possible, and the different columns of assault would move directly and silently to their prescribed points of attack. If breaches are to be made by gun cotton or gunpowder, every effort should be made to place the explosive and ignite the fuses before the attack is discovered and to assault immediately the explosion has taken place.

The assailants should not stop to fire, but should endeavour to come to close quarters at once.

Infantry and artillery if not exposed to distant fire.

3. *A combined attack of infantry and artillery on a house screened from distant artillery fire* would commence as the unaided infantry attack by day; but as soon as the firing party of infantry had established a decided ascendancy over the fire from the building, two or more guns would be brought up into line with them, screened as much as possible by the slopes of the ground, trees, &c., and, by their fire, break down obstacles, breach the building and set it on fire. When the artillery fire has prepared the way, the assault would be given, if the garrison has not previously succumbed.

If exposed to distant artillery fire.

4. *A combined attack of infantry and artillery on a house exposed to distant artillery fire.* The artillery commences the attack concentrating the fire of all the available guns on the building. This fire will probably drive the defenders from the building. If it also ruins it and sets it on fire, the infantry on their approach will only

have to deal with the defenders of the outer line of defence, if there be such. If, however, the building should still be defensible when the attacking artillery is obliged to cease fire owing to the near approach to the building of their own infantry, and the attacking infantry cannot force their way in, it may be necessary to bring some guns up to within musketry range to breach the building as in (3).

Defence of houses. Let us now consider the corresponding tactics of the defence:—

1st Case. *In the* 1*st case*, accurate fire from the building should hinder the approach of the enemy, and inflict loss upon him; but should he succeed in establishing an overpowering line of fire—it would be good policy to withdraw the men from the loopholes, until the storming parties advance, and then to concentrate fire on them, particularly while checked by the obstacles. This fire as rapid as possible, must be very deadly, and will probably beat off the attack.

2nd Case. *In the* 2*nd case*, surprise should be avoided by all possible means, particularly by careful patrolling, and any attempt to lodge explosives against the walls, secretly, must be carefully guarded against. When the attack takes place, a grazing and flanking fire on the obstacle, delivered as rapidly as possible, must inevitably take effect, and will probably frustrate the efforts of the assailants.

3rd Case. *In the* 3*rd case*, it will generally be best to reserve the fire of, at any rate a portion of the garrison until the guns are brought up, and then to concentrate fire on their gun detachments, and finally on the assaulting columns.

4th Case.

In the 4th case, the garrison should generally be removed from the building during the cannonade, and be placed in shelter trenches beside it, or under cover in rear, until the near approach of the attacking infantry compels their artillery to cease firing, when, if the buildings are still tenable, they should be rapidly occupied again, and the entrances which should in this case be sufficiently numerous, barricaded. Should the buildings take fire during the cannonade, a few volunteers should endeavour to extinguish the flames.

Fortification of houses.

To fortify a building, the following are the successive steps which should generally be taken:—

Hasty.

1*st for a very hasty defence—time* 1 *to* 3 *hours.**

a. Remove the inhabitants, and all easily combustible materials, and provide water.

b. Barricade the doors and accessible windows so as to resist ingress and musketry fire. Inaccessible windows should at least be masked, so as to hide the defenders, and the glass broken out, one door with a moveable barricade, or a window with a ladder to be reserved for escape.

c. Make loopholes. These should be left open in barricades. They may be made with the axe in doors and window shutters, with the pick-axe or crowbar in thin walls, or by removing tiles at the eaves of the roof.

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* When time and means are at a minimum, as in the case of buildings stormed during a battle and to be held as tactical points to secure the ground won, it may only be possible to make loopholes and to barricade the doors. Loopholes even may be beyond the means of the troops, existing openings, doors and windows must then be used.

d. Clear away cover in the vicinity as far as time and means allow. In doing this, obstacles should be created when possible.

2nd. For the careful preparation of a building for defence—Time, 24 to 48 hours.

Deliberate.

a. Make a rough survey of the building and its vicinity, and determine on the plan of defence, particularly what out-buildings or parts of the main building are to be destroyed, what is to be the extent of the defensible enceinte, what buildings or trees in the vicinity should be left standing as screens from distant artillery fire.

b. Clear an open field of fire around the building, removing and burning easily inflammable materials, collecting those suitable for barricades and obstacles, and improving existing fences, &c., which are in positions suitable for obstacles—any hollow ways may be filled with felled trees, brushwood, or other available materials which will prevent them from giving cover to the enemy, and houses which cannot be destroyed may be burnt to prevent the enemy from firing from the upper windows.

c. Prepare a defensible enceinte, as decided on, by barricading windows and doors (except one door reserved for use, and which must be specially dealt with), making loop-holes, providing flank defence and obstacles. Inside the building, improve communications, make banquettes where necessary, place in each room a large vessel full of water and a small vessel for drawing it. Store provisions and ammunition. Set apart a place for a hospital, and prepare latrines. If the house is liable to be attacked by artillery, it may be of some use to shore up the floors and to spread 3 inches of earth on the boards. If the house be very large and strong, and it is to be held "*à outrance*," arrange for step by step defence, by loopholing partition walls and upper floors, and providing moveable barricades to cover the retreat from one part of the building to another.

Stairs rarely to be removed.

It may occasionally even be advisable in such a case to remove the stairs and to substitute ladders; but ordinarily the defence would lose more by such an arrangement, by the imperfect communication, than it could hope to gain by the additional obstacle.

d. In the case when a distant artillery attack is to be feared,—provide shelter trenches for the garrison outside the building, usually on its flanks. Existing fences or folds of the ground may answer the purpose. An outer line of defence should never be prepared from which the garrison is to retreat *into* the house. Should an outer line be desirable, as often will be the case, its defenders, if overpowered, should retreat *past* the house exposing the pursuers to its fire.

DETAILS OF DEFENCES.

Details of fortification.

Barricading doors and windows.

Barricading doors.

Of the many ways in which doors may be barricaded the following are some of the best:—

1. Fill boxes, barrels, cupboards, &c., with earth, or better with bricks or stones, and place them against the door inside.
2. Build a wall of bricks, or place flag-stones or hearth-stones against the door inside; inside this, and to support it, place one of the inner doors of the house taken off its hinges, and either strut it, or if there be a passage leading to the door, secure it by strong bars passed through holes in the walls of the passage.
3. If a railway be near, pile sleepers laid horizontally one upon another on the door sill so as to make a wall of timber outside the door, in contact with the wall (for ordinary doorways sleepers may be sawn into two lengths). Keep the sleepers in place by two or three rails placed vertically outside them, and sunk 3 or 4 feet in the ground and firmly rammed. Horizontal loopholes may be left between the sleepers, by nailing blocks of wood on one of them at the proper level. The rails may be held in position and the whole structure made secure by tying them firmly with telegraph wire to corresponding vertical posts inside.
4. Timbers may be laid horizontally upon one another against the wall *inside* the doorway, and spiked to vertical ribbands which are held at the foot by blocks nailed to the floor, and at the top by struts.

Many other methods will suggest themselves which may be found more suitable under special circumstances.

Barricading windows.

Windows may be barricaded by similar means. If there are shutters they should be made use of. Generally it will be found convenient to barricade *inside* if the shutters are inside, and *outside* if the shutters are outside.

Door reserved for use.

The door reserved for use should be in a re-entering angle of the building if possible. Often a door may be selected which is so situated that it cannot be fired into from the outside. If otherwise, a cupboard or wardrobe, or a couple of chests placed one on the other, filled with earth or bricks, and placed on rollers, may be used to secure the door from being fired through or burst in. Sometimes the door may be made bullet proof, by nailing timber or iron on it, and be secured by strong struts and bars; but as 5 in. or 6 in. of hard wood, and three times as much of soft fir, or ½ in. iron are necessary to keep out bullets, it evidently is not an easy matter to provide them for the object in view.

If a door be so strengthened, the extra thickness should be nailed on the side towards which it *shuts*, or it will prevent it from opening properly.

The entrance should have double defences if possible, either by a tambour outside, or by an inner door in the hall flanked by loopholes in the side walls and in the floor above.

Upper floors.

The windows on the upper floors generally require only to be made bullet proof, and to a height sufficient to cover men's heads. Bedding used to be recommended for this purpose, but it is not proof against modern rifles.

Bedding not bullet proof.

Bricks obtained from openings in partition walls, generally required to improve the communications, or hearth stones, kept in place by the shutters and planks, or articles of furniture, will generally suffice. If timber be used it may be placed vertically, nailed to horizontal ribbands, strutted back to the floor.

Loopholes.

Loopholes on the lower floor should be horizontal when it can be so arranged, and vertical on the upper, so as to allow as much lateral range as possible to the grazing fire from the lower floor, and as much depression as possible to the fire from the upper floor. The arrangements suggested for barricading are suited to this formation of loopholes in the doors and windows. The number and situations of the loopholes will depend on tactical considerations as before mentioned. Generally it will be advisable to make more loopholes than can be used by the garrison at one time, so as to allow of increasing the fire in any direction according to circumstances.

The minimum distance apart of loopholes depends on the thickness of the walls and their strength—4 ft. is the ordinary interval, to be increased to 6 ft in the case of thick walls loosely built; it may be reduced to a pace in good 9 in. brick walls, if desirable. Very thick walls such as those of churches, cannot be loopholed, the fire must be delivered from the windows and doors and possibly from the roof. On the ground floor, the loopholes for direct fire should not be less than 6 ft. above the ground outside—but loopholes for flanking fire may often be advantageously made near the ground, so as to avoid dead angles. The floor must be broken away inside to allow of men using these low loopholes. Loopholes at the angles of a building are specially necessary when the angles are not flanked. Several tiers of fire may be arranged in such a case at the angles, care being taken not to weaken the building so as to endanger its stability. Banquettes, where necessary on the ground floor, can generally be made with furniture and planks, but they should be firm and steady. A commanding line of fire for men in close order may often be obtained with very little labour, by removing tiles or slates from just above the eaves of the roof, so that the men fire over the top of the wall.

Ventilation.

Ventilation and light must be secured by leaving openings at the tops of the windows when barricading them; by smoke-escape-holes through the walls, under the ceilings in top stories; or in buildings with only one floor, by removing tiles or slates and breaking the ceiling away if there be one.

Flank defence and obstacles.

Flank defence and obstacles.—A good obstacle is generally to be preferred to flank defence, if the choice lies between them, but the combination of both is always desirable. To create flank defence where the form of the building gives none naturally, machicoulis galleries or tambours may be used. The tambours may be either open stockades or sunken kaponiers, roofed over.

Machicoulis, tambours, and sunken kaponiers compared.

These sunken kaponiers have the great advantage of being almost safe from artillery fire; they are, however, inapplicable when the ground is uneven. An open stockade is always a weak point in the defences, being peculiarly liable to assault; but it can be constructed with less skilled labour than a machicoulis. A machicoulis gallery has the advantage of delivering its fire from loopholes so placed that they cannot be fired into by an enemy at a distance.

Machicoulis galleries are easily prepared when the house has balconies, by making the parapet musket-proof by hearth stones, bags full of earth, &c. If there be no balconies, an upper window must be used, the wall below it being broken down to the level of the floor. Two beams or strong poles are laid on the floor, and the ends pushed out 3 or 4 feet through the opening—the inner ends firmly lashed or spiked to the floor joists; on these supports planks may be laid and a parapet built; a four-legged table, laid on its side, will form a good support for a parapet of hearth stones and bags of earth; one or two men can fire downwards, sitting or kneeling on the floor and protected by the parapet. **Machicoulis.**

A stoccade tambour may be from 6 to 9 feet square in plan, inside, for 3 men firing each way. The earth taken out of the trench in which the timbers are planted should be thrown inside to make banquettes. **Tambours.**

To flank great lengths of wall, tambours should be made long enough for 4, 5, or 6 men, firing each way.

Existing openings should be used if possible to communicate with tambours or machicoulis. Occasionally, however, it may be well to construct a tambour at the corner of a building where an opening must be made to communicate with it. The *head* of the tambour should be flat or nearly so; the *obstacle* may be traced so as to be flanked from the building.

For a sunken kaponier tambour, it is almost essential that there should be an underground story, otherwise the access to it will be difficult. The ex-

Sunken kaponiers.

cavation may be 3½ feet deep, 6 feet wide, and from 6 to 9 feet long. The sides of the excavation left as steep as they will stand. A log laid on the ground on each side of the excavation, over which the men fire, raises their parapet to 4 ft. 6 in. Three or four transverse logs are now laid on these, slightly notched and secured with dogs, spikes, or lashings, and again 3 transverse to the last, all secured in a similar manner. On the last set of timbers are laid planks or beams, and the whole is covered with the earth from the excavation; the end farthest from the wall is banked up with earth. There are thus long horizontal loopholes left between the transverse logs a foot above the ground. The access is by an opening in the wall of the basement.

Obstacles.

Obstacles are always advantageous, but they are specially valuable at night. The best obstacle, if it can be procured, is a good abatis. In default of materials for this, palisades, wire entanglements, pickets, or any other means at hand, such as fences, pieces of water, shrubberies, &c., should be used and improved. It is generally recommended that small ditches should be dug outside doors and windows; this, however, is labor thrown away, the obstacle being insignificant; nor is such a small ditch formed all round the building, the excavated earth being banked up against the wall, of any value, either as an obstacle, or as protection against artillery fire, or against breaching by gunpowder or other explosives.

Ditches of little value.

Passage through obstacles.

In preparing obstacles, the approach through them to the door reserved for use, should be made as circuitous as possible and under a cross fire.

The line of obstacles should be continuous, at least opposite the weaker parts of the building, and should be connected with the walls at the ends, and also at intermediate points, if possible, in order that it may not be turned, or that an enemy having penetrated at any point may not extend close to the wall, under the defenders line of fire.

Line of obstacle to be continuous.

CHAP. VIII.

ON THE DEFENCE AND ATTACK OF FARMSTEADS, HAMLETS, VILLAGES AND TOWNS.

Groups of buildings with enclosures adjoining, offer generally greater capabilities of defence than isolated buildings, both on account of their greater extent giving cover to a larger body of men, and also because an outer line of fences and enclosures may be held, at any rate by skirmishers, during the cannonade preceding an attack by infantry. This outer line may be reinforced when the artillery fire ceases, and the second line may then be occupied by troops kept under cover during the cannonade. Thus there will be little risk of the assailants gaining an advantage during the movements of the defenders consequent on the cessation of artillery fire.

Villages more defensible than houses.

When comparatively small groups of buildings are occupied for military purposes, the civil inhabitants can, and must be removed, and they can usually find shelter in neighbouring buildings; but if a large town be so occupied, it is impossible to clear it from its inhabitants, and the mode of defence must there-

Towns not generally defensible.

fore be modified, both from motives of humanity, and also in most cases from military considerations. The garrisons of comparatively small localities will be small, and their movements can be made easy by opening a few gaps in walls and fences—but for the defence of larger localities, larger bodies of troops are required, and their movements would probably be much hampered in a town. The risks of fires which would destroy the stores, probably collected in the town, and the shelter it affords the troops, and of insurrection of the inhabitants have also to be considered, apart from the feeling of humanity which would deter one from exposing the civil inhabitants, women and children, to the dangers of war. Should it be desirable therefore to occupy a town as a military post, the defensive line would usually be established at such a distance outside the town, as would keep the enemy's artillery from bombarding it. The position becomes in fact changed from the defence of the town proper, to the formation of an entrenched camp around it—such as that made by the Prussians at Dresden, in 1866.

Except in civil wars.

The step by step defence of a large city by barricades in the streets, is a case that can rarely occur except in civil wars. Those who defend the barricades trust to the humanity or national feelings of their adversaries to escape bombardment; but although they may bid defiance to direct attack, the slower method of turning the barricades by working through the houses, will certainly prevail in the end, as it did in Paris in 1871.

It may often be necessary to establish fortified posts in towns or cities, when a country is in military occupation, to overawe the inhabitants, to secure the passage of bridges over rivers, and to form barracks and depôts for the force occupying the country, with their necessary stores and provisions. Strong buildings may be of great assistance in forming these posts, giving shelter to troops and stores, and also adding much to the strength of the defences. Considerable clearances will generally have to be made in such cases to form good communications between the posts, and to give good range for the weapons of the defenders. A good example is to be found in the Defence of Lucknow, described in Vol IX., R.E. Professional Papers.

Fortified posts in cities.

Farmsteads, like isolated houses, often form valuable tactical points; but hamlets and villages situated on roads, and frequently at junctions of roads, have an additional importance on this account. In uncivilised countries, or when from any circumstances artillery fire is not to be expected, villages and groups of buildings may advantageously be defended as isolated posts; but in civilised warfare, they ordinarily are of value only in connection with defensive positions, forming tactical supporting points either in the position or in advance of or in rear of it. If unsupported and exposed to a concentric attack by infantry and artillery, a village, however skilfully fortified, has little chance of successful resistance. The buildings would be set on fire, the lines of defence enfiladed and taken in reverse, and the garrison demoralised by the shells which would inundate them from all sides.

Villages often derive importance from being at junctions of roads.

Villages not defensible as isolated posts if attacked with artillery.

Against a front attack however, if the buildings be substantial, and more particularly if by folds of

But may be held as tactical points in, or in advance of, line of battle.

the ground, trees, or other buildings, the defensible line be protected from distant artillery fire, a village may make a formidable resistance. The defence of St. Privat on the right of the French position at Gravelotte, will always remain a most remarkable example of the defensive value of a village when favourably situated. The peculiar formation of the ground on which this village was built, accounts for the wonderfully small result obtained by the concentrated fire of 200 German guns. They fired up-hill at the village, and could only see the buildings and enclosure walls of its western outskirts, behind these the ground fell, forming a sort of saucer-shaped hollow in which the reserves were close at hand in almost perfect security. Some shelter trenches on the flanks, some fresh ammunition, and a few supporting battalions at this point would probably have changed the fortunes of the day.

Example, St. Privat.

Attack of villages.

The modes in which villages may be attacked are very similar to those already described in the case of houses, except that a step by step defence of the village is generally possible, if suitable arrangements have been made; and the attack must be prepared to overcome this prolonged resistance, particularly by flank attacks or even attacks in rear, and sufficient reserves. From the records of the wars of 1866, 1870-71, we may gather that a fortified village if sufficiently garrisoned, and if it be favourably situated, is secure against an infantry attack by day; but that a combined attack of infantry and artillery by day, or of infantry alone at night, if made in sufficient force, and persevered in, will probably succeed, although the loss incurred will be heavy.

Examples.
Diletz.

As examples of infantry attacks by day we may refer to the combats in and around the villages near Gitschin on 29th June, 1866. The village of Diletz was attacked by 9 companies of Prussian infantry. It was defended by Saxon infantry supported by Austrian artillery, and the attack failed. Three batteries of Prussian artillery were then brought up to engage the Austrian guns (but not to fire on the village), and under cover of this fire another infantry attack was delivered which did not succeed until an Austrian regiment in rear of the village fired by mistake on the defenders, who then gave way.

A counter-attack attempted by the Austrians and made in great force, but without preparation by artillery, failed under the rapid fire of the Prussian soldiers firing from behind the enclosures outside the village.

In these cases it must be remembered that the Prussian breechloader was opposed to the Austrian muzzle loader.

Perhaps no more instructive examples of combined attacks of infantry and artillery by day, and of infantry attacks by night, are to be found than those which took place during the great French sortie from Metz on the 31st August and 1st September, 1870. The French attack commenced at about 9 a.m. on 31st August, and was directed in considerable force on the village of Colombey, held as an advanced post by the Germans. The country in the vicinity was wooded and broken, and the Germans being greatly out-numbered, retreated; apparently there was not much fighting, and artillery was not used. No further attack was made until some position artillery,

Sortie from Metz, 31st August, 1870.

for which batteries had been constructed near Grimont, opened fire at about 3.30 p.m. on Noisseville and la Brasserie. These points were then strongly attacked by infantry, and carried at 6.30 p.m. After dusk, a German infantry counter-attack was made, and at 9 p.m. Noisseville was again in their hands. At 10 p.m. the whole French line advanced, and they took Flanville and retook Noisseville. They then made a concentric infantry attack on Servigny, whence they expelled the Germans, except from the few last houses. *These houses were the starting point for the counter-attack*, which regained Servigny for the Germans. French attacks made at the same time on Failly and Poixe were unsuccessful, and at 11 p.m. the battle was over.

During the night the Germans brought up fresh troops, and at daylight Noisseville was heavily bombarded by artillery, and then assaulted by infantry; the assault was repulsed three times, but the fourth time it was successful. Flanville and Coincy were not so strongly defended and were retaken soon after 9 a.m.

The French attacked the fortified villages of Rupigny and Failly at 9 a.m. with infantry and artillery, and at 11 a m. they made a final effort on the line Poixe-Servigny, they failed in both, and were driven within their lines by the German advance.

It is to be noted that the line Rupigny-Failly-Poixe had been much more carefully fortified by the Germans at this time than the line Servigny-Noisseville-Colombey, and that the latter was very weakly garrisoned at the time of the sortie. The nature of the country on this side is also more favourable to attack than that on the northern line, being wooded and broken.

Night attacks generally successful.

We observe, also, that infantry attacks at night succeeded on both sides; but a village strongly held and imperfectly fortified like Noisseville was only retaken during daylight by the Germans after a bombardment and three unsuccessful assaults; it was originally taken by the French after a bombardment and an infantry attack in great force, the garrison being weak. The well fortified villages on the northern line were held by the Germans against all French attacks.

Position outside village often to be preferred to defending the village itself.

Before entering on the defence of villages it is necessary to observe that it frequently happens that a village is *only* important because roads pass through it, and if on examination it should appear that a better position for defence exists *outside the village*, which equally well commands the roads, it will evidently be best to fortify that position in preference to the village. Such cases frequently occur in highly cultivated and enclosed countries like England. Hedges, banks and fences often have much greater capabilities of defence than the weakly constructed and scattered buildings of which so many English villages consist.

Cases in which villages may be held as isolated posts.

When villages are held as *isolated posts* they are either used as magazines, or supporting points on lines of communication, or as posts for advanced guards or detachments of troops in observation at some considerable distance in front or on the flanks of an army. A village held as an isolated post must evidently be made defensible on all sides; rarely, however, as before observed, can such a post be tenable against an attack in any force by artillery and infantry.

Villages as advanced posts.

Villages occupied as *advanced posts* of an army in position, must be made defensible only in front and on the flanks; they should always be left open in rear to facilitate recapture, or retreat, should they be overpowered by the enemy's attack.

Villages in the position.

Villages occupied as tactical points *in* or *on the flank* of a position, may sometimes be advantageously closed in rear, so that their defence may still be maintained, even should the enemy pass by them on either flank, and so aid in the recovery of lost ground; but the total loss of the garrison of the village is risked by such an arrangement.

Requirements in a village to defended.

Villages are suitable for defence,—

1. When well situated, to fulfil the object in view.
2. When in plan the buildings and enclosures are so combined as to be capable of giving cover to sufficient numbers of infantry firing in the required directions.
3. The buildings substantial and not easily set on fire.
4. A clear range for infantry fire.
5. Sheltered from distant artillery fire.

The 1st requirement is evidently all-important; the 2nd shows that villages in a long straggling street are rarely so suitable for defence as those which are more compact in form, with squares and substantial buildings in the interior; the 3rd is of great importance when an artillery attack is to be apprehended—of less importance against an infantry attack; the 4th may often be obtained by demolishing and clearing away cover in the vicinity; the necessary time and labour must be considered; the 5th is not *essential* if the village be substantial as in (3); but it is always advantageous, and leads to the conclusion that *villages in small hollows are generally better able to resist a modern attack than those on eminences*, which are more exposed to distant artillery fire. Woods screening a village from artillery may answer the same purpose as an intervening rise in the ground, but in either case (4) must be attended to.

Steps to be taken in defending a village.

An officer charged with the defence of a village should first of all understand clearly the object for which it is to be held, and what are the duties of the garrison. If occupied by an outpost on a road at night for instance, the object would be to hinder for a time the advance of any strong body of the enemy, and to bar that of small bodies; but not to risk serious loss or capture by continuing the defence if the retreat is endangered. In such cases temporary barricades at the entrance or entrances of the village with passages for patrols, and such a disposition of loop-holes, &c., as to bring a strong fire on the roads, to guard against flank attacks, and to cover a retreat, would be all that would be desirable. Houses should not be made defensible, nor troops shut up in enclosures of any sort.

For a temporary outpost.

For an advanced post.

If the village were to be defended as an advanced post to a position, the objects would be to keep the enemy at a distance, to flank the front of the position and perhaps to facilitate offensive returns. Strong fire to the front and flanks, barricades on the roads, obstacles on front and flanks, and an open gorge would be the general arrangements; a 2nd line, or keep, to strengthen the defence; well arranged paths for retreat from the outer line, right and left of the inner line; and cover for supports and reserves, to reinforce the 1st line, and make counter-attacks inside, would also be most desirable. If cover for the outer reserves does not exist in rear of the flanks, shelter may have to be prepared for them.

Inner reserves.

Outer Reserves.

If ordered to fortify a village, an officer having been made acquainted with the objects of the defence, should first make a survey of the village with such degree of accuracy as his means and the time available will permit. With the aid of this he decides on the outer line of fences, walls, &c., supplemented where necessary by shelter trenches, the perimeter suited to the numbers of the defenders, the directions of the lines such as to bring fire in the required directions, and to be as free as possible from enfilade or reverse fire. As regards buildings in this front line, it must be borne in mind that buildings with *thick* walls, particularly if of hard stone, are very dangerous to troops in front of them or on their flanks, although they protect men inside them or behind them from artillery fire; because shells striking the walls, if they do not pass through but stick in them, act as mines and throw back splinters of stone and iron; even if they glance they probably burst and knock off some splinters of stone, in addition to those formed by their own material. Buildings with thin brick walls (up to 18 in.) are penetrated by shells, which burst after they have passed through, and the fragments are absorbed inside the buildings.

Survey to be made.

Points for decision.

Outer line.

Effects of artillery fire on buildings.

Hence the rule—never place troops beside or in front of buildings which have thick walls, nor inside those which have thin walls while under artillery fire.

Consequent rules for posting troops.

He must also decide on the buildings, fences, &c., which should be cleared away to give a clear field of fire, and the trees, buildings, &c., which should be left standing to give cover from artillery fire. Buildings with thin walls may often be used as traverses on lines liable to enfilade.

Clearances.

The working party can now generally be set to work on clearing away cover in the vicinity and in collecting materials.

Employment of working party.

A 2nd line or reduit, or it may be several reduits are then fixed on, and lines for retreat and positions for supports and reserves selected. In forming the 2nd line, stockade work may sometimes be used with advantage to connect buildings in those parts which are screened from artillery fire by buildings in front.

2nd line or reduit.

The flanks of the 1st line, in a tactical point, such as a village, are best secured by a line of obstacles running back to the 2nd line and flanked by it. Openings in the 2nd line must always be arranged in secure positions, either for moving out supports to reinforce the 1st line, or for counter-attacks, or for the retreat of the troops in first line if overpowered; and in the latter case, the lines of retreat must be carefully arranged, so that the retreating troops may not mask the fire of their supports in 2nd line.

General arrangement of 1st and 2nd lines.

If the village be large, the front to be defended should be divided into two or more portions, each assigned to one tactical unit which forms its own supports. If too large for the force defending it, a portion must be demolished, or a break made between the defended and the undefended portions.

Roads how dealt with.

If a road through a village is to be left open for use, the barricade should be made like the traverses in a double sap, and the adjoining houses loop-holed; generally a wide part of the road can be selected for the purpose so as not to reduce the average width at this point. Several such barricades may be made in succession if the defence is to be very obstinate, and the passages through them may be made only wide enough for one man to pass, if required for patrols.

Earth works.

To entrench a village by a line of earth works outside it, is not to be generally recommended, as it would entail unnecessary labour. The skill of the officer designing the work should be shown in utilizing the cover and obstacles which are to be found already in existence; supplementing them when necessary by shelter trenches or field works of stronger profile, if time and means are available.

Houses.

Houses in the outer line may be loop-holed, but should not be occupied during a cannonade. The walls of houses next the enemy will be penetrated by shells, which will burst inside the houses, but rarely will penetrate through the rear walls, so that troops *in* the houses would suffer heavily; but *in rear* of them they are almost safe when under fire of *field artillery*. Hence the great advantage conferred by a village on its defenders in an open country is the cover afforded by the houses to *reserves*. The active defence is conducted by a thin line occupying the outer line of fences, walls, &c., but this thin line is constantly fed by the reserves, kept under cover until wanted, behind the houses. Should the outer line be forced, and a close encounter ensue in the village, the 2nd line or reduit comes into play and aids in the recapture of the outer line.

Redoubts. It has been recommended to construct redoubts at the angles of the outer enclosures of a village; but such a course would not generally be advisable. A redoubt capable of offering resistance to a modern attack of artillery and infantry absorbs the labour of about three times its garrison for eight or nine reliefs, and requires a large quantity of timber for bomb proofs, &c. Such a work is, therefore, out of the question for a *hasty* defence. A redoubt of weak profile without bomb proofs is untenable if seriously attacked, and its garrison would be less injured by the enemy's fire, while they would be able to inflict much greater loss on him, if extended in a shelter trench or in rear of fences and walls.

Artillery. The artillery intended to co-operate in the defence of a village, should not be placed within the *enceinte*, but on its flanks crossing fire in front of it, unless it be an isolated post, in which case the guns become garrison guns, and must be treated accordingly.

Reserves. Infantry reserves can generally be placed in security from the enemy's artillery in rear of the village, prepared to act to a flank or to reinforce the defenders, or to drive out an enemy who may have forced an entrance at any point.

Shelter trenches for reserves in rear. Sometimes it may be necessary to make shelter trenches for them, but this will be a rare occurrence, probably only when the ground rises steeply in rear of the village. **Or for supporting troops on flanks.** Shelter trenches behind the flanks of the village, and parallel to its front, are often valuable in an open country, for instance they would have been very valuable in the defence of St. Privat, on the French right at the battle of Gravelotte. Probably they would have been made, had Canrobert's Corps, which defended this flank, been complete, which was not the case; it was deficient in many points. All the entrenching tools, amongst other things, having been left at Chalons.

Work to be done for securing possession of a village which has been captured.

The troops destined for the attack of a village should be closely followed by a working party with tools for entrenching the village when captured. It may also be needful to have some engineers with the advance to remove obstacles; in ordinary cases, however, this will be effected by artillery fire. The work to be done for securing the village when captured, against a counter-attack, must evidently be of the roughest and most hasty description, and will consist ordinarily of barricading the entrances and loopholing walls and houses on the enemy's side of the village, and perhaps supplementing or extending the line of musketry by shelter trenches. The defences which have been overcome may then be destroyed as far as possible, and a second line of defence arranged.

Counter attack.

A counter-attack to recover a village which has been lost should be made as quickly as possible, before the enemy has time to entrench and establish himself in it. If circumstances do not admit of this immediate counter-attack, which would be an infantry affair, the way must be prepared by artillery, if the attack is to be made by day, or by engineers, if it is to be made by night. The night attack is in most cases to be preferred as offering the greatest probability of success.

The defenders of the village should clearly understand that the *front line* is that which is to be defended; the reduit or 2nd line is *not primarily to cover retreat, but to aid in counter-attack and recovery of the front line,* should the enemy force his way into any part of it, and to prevent him from effecting his immediate object in the attack, viz: to attain the farther edge. The 2nd line or reduit should therefore be always arranged with reference to this counter-attack to be made by the special reserves. Ordinarily the best tactical arrangement will be one man to the pace in front line; supports half their number lying down under cover, as near as possible; inner reserve garrisoning the 2nd line, or reduit, of strength suitable to the line to be defended, generally half 1st line, outer reserves in rear of the village, about equal to the whole of the garrison.

Tactics of defence.

Disposition and numbers of garrison.

CHAP. IX.

ON THE DEFENCE AND ATTACK OF WOODS.

The military value of woods depends on their *nature*, their *position*, and their *extent.* Woods may be open and passable by all arms; or although not much obstructed by underwood, they may be of such close growth as to be impassable for artillery, and only with difficulty and in open order by cavalry or infantry. A thicker growth would make the wood only practicable for infantry skirmishers moving slowly; and in some cases the tangled underwood and creepers, swamps, and rocks may constitute an impassable barrier to all military movements. The

Woods: their military value depends on nature, position, and extent.

Different natures of woods.

size of the trees may be such as to stop the projectiles of field artillery, in which case at some little distance from the edge of the wood troops will be in security from artillery fire; or the wood may be only of a few years' growth, as copses, giving no protection from artillery fire, nor even from musketry, near the edge, but only serving as a screen.

Defenders lose their advantage when enemy is in the wood.

Whatever be the nature of the wood, it must be borne in mind that *within* it assailants and defenders are on equal terms, and the presumable superiority of the assailants in numbers or morale ought to push the defenders out when once they have succeeded in winning the outer edge, and this has been almost the invariable result in actual warfare. Hence the edge of the wood nearest the enemy is the important line.

Outer edge the important part.

Entangling hither edge to prevent enemy from debouching.

Dividing the occupied from the unoccupied portion by felling belt of trees.

This belt, if possible, at foot of a slope.

The position and extent of the wood must determine whether or not it can be held. If it be too extensive or too far from the position to be occupied, then it can be rendered comparatively useless to an enemy by felling and entangling the edge nearest to the position, so as to prevent him from debouching from it, or a belt can be felled in the wood, separating the portion which is occupied from that to which the enemy has access. This belt should always, if possible, be in a hollow, along a watercourse or valley line, so that the defenders may fire from a shelter trench on the higher ground upon the assailants as they try to pass the obstacle formed by the felled trees, otherwise the defenders will not have a clear view of the assailants.

If ground level, raise parapet and lower obstacle.

If the ground be quite level the breastwork must be made as high as possible by means of logs and earth, and the entanglement kept as low as possible.

Width of belt.

The width of the belt must be sufficient to form a good obstacle. Four rows of trees, or from 15 to 20 yards may be looked on as a minimum.

Shelter trench.

The shelter trench may be a little way back in the wood, and the men's heads should be protected by a log, crowning the parapet. The experience of the American war proves that such a line, if properly defended, is impregnable.

If trees large how dealt with.

If the trees be large and of hard wood, it is sufficient to lop the boughs and form an abatis and entanglement with them, and the underwood (if there be any). The trees in this case will be so far apart that the defenders, 20 yards retired from the edge of the wood, can fire from their shelter trench between the trunks of the trees at the enemy advancing to the attack, or attempting to overcome the obstacles. In either case the reserves will be well protected, and the trees will considerably lessen the influence of oblique artillery fire on the defenders of the front line, notwithstanding the occasional casualties from splinters of wood.

Diminished effect of artillery fire.

Fortified wood strongest sort of tactical point.

Salients to be first fortified.

Openings for offensive movements in re-entering angles.

A wood in a position, if it has a clearly defined edge and open ground in front of it, is a great element of strength even without fortification; but if the edge be fortified, that part of the position may be looked upon as quite secure if defended by one man to the pace, well supplied with ammunition, and with sufficient reserves to replace casualties. If the edge of the wood forms salients and re-entering angles, the salients should first be fortified in the manner above described. Sometimes it may be desirable to reserve the power of offensive movements, in which case the re-entering angles should not be obstructed, but shelter trenches may be made there to flank the salients. Such an arrangement implies, however, that the wood is to be held in force; it would not be suited to a passive defence, as an attack in force would press in between the obstructed salients, thus turning them and gaining a hold on the wood.

For a passive defence obstacle continuous.

Shelter trenches at salients and re-entrants.

For the passive defence of the edge of a wood of considerable extent by a minimum of men, the obstacle should be continuous; but shelter trenches for the defenders need only be made at the salients and re-entering angles. Labour may sometimes be saved, and the strength of the line increased by making a line of abatis across a deep re-entering bend, instead of making an entanglement all round it.

Second line.

A second line may be formed in a wood, if clearings or broad roads exist in suitable positions; it may even be desirable to make such a line artificially if the possession of the wood be of great importance and time and means are available.

Lines of communication prepared and marked.

Division of wood into sections.

In all cases the lines of advance for the supports must be distinctly marked, either by clearing paths, or, if the wood be open, by "blazed" marks on the trees. A division of the wood into sections, to be defended by tactical units, each forming their own supports and reserves, may also be advisable in some cases, if the front be very extensive; the divisions being made by felling belts of trees, which will prevent a success of the enemy at one point extending to the whole wood.

Roads, how secured for passive or active defence.

The roads traversing a wood must be blocked by felled trees, and a specially strong fire brought on the approaches at these points if a passive defence be intended. For an active defence, those roads which would be of use in making offensive returns should be left open, but should be barricaded either inside or outside the edge of the wood as may be most convenient, a new piece of road being formed, diverted round the end of the barricade.

Defence of a small wood.

To defend a small wood as a tactical point, the edges of the front and flanks must be fortified as already described; generally, the rear should be left open; but in some cases, this also may be fortified, small openings being left for reinforcements. No openings should be left on the front or flanks, as offensive movements would not be made out of the wood, but on either side of it. If the wood be bounded by fences, these may be used for cover, abatis being formed in front as an obstacle instead of felling a belt and entangling it. Paths for circulating round the wood and for bringing up reserves to the front or flanks, must be prepared or improved.

Copses.

Copses are only useful as screens or as obstacles. They are impassable if the edge be entangled by half cutting down and interlacing the boughs, and this obstacle be efficiently flanked; and they are excellent screens, but it must be remembered that they give no protection from artillery fire, and but little from musketry.

Examples of the defence of woods abound in the history of the war of 1870-71, while the American civil war was carried on almost entirely in woods, and the troops were in the constant habit of improvising fortifications at every halt, often many times in the same day.

As examples, however, the following may be noted:

1. *Wood held as an advanced post.* The wood near Champenois and La Folie, on the battle-

field of Gravelotte, fortified by the French, which was held by them to the close of the day, notwithstanding the reiterated and persistent efforts of the Germans, who attacked in force with both infantry and artillery.

2. *Woods held as tactical points in a line.* The Bois de Failly and the woods on the line Ars-Laquenexy, Mercy le haut, Peltre, in the investment of Metz, 1870.
3. *Defence of woods by belts cut through them.* The wooded country, between Bougival and and St. Cloud on the west of Paris, and the Forest of Bondy on the east, during the investment of Paris in 1871.
4. *Wood rendered useless to an enemy to debouch from by felling the hither edge.* The N.W. edge of the wood of Woippy, north of Metz, which served the French as a base and screen for assembly of troops in their sortie of the 7th October, was afterwards felled and entangled by the Germans, and flanked from the heights above Saulny and Villers les Plesnois.

Attack of woods.

In the attack of woods the effect of artillery fire must not be over estimated. It would seem that in a wood of well-grown trees troops are practically secure

Artillery.

from artillery fire, when so far retired from the edge near the enemy that daylight cannot be seen between the trunks of the trees. Hence, although the front line is more or less exposed, the reserves are well sheltered. It is on the edge of the wood, then, at the part where it is decided to attempt an entry, that the concentrated fire of artillery must be directed. The

Infantry.

front line of the infantry attack should engage the whole edge of the wood, but the attack must be pressed home with all the available power at the point selected. When once a footing has been gained, the troops in front must be constantly replenished from the rear, and the wave propelled forwards and extended right and left until the farther edge of the wood is reached.

Attack of 2nd line.

Should a second line have been prepared by the defenders, every effort should be made to push through with them as they retreat, otherwise the advantage is all on their side, as artillery can lend no farther aid.

Data for Estimation of Labor, Tools and Materials for Works ordinarily required in hasty Entrenchments.

1. *Felling Trees.* Two skilled men fell from 100 to 150 fir trees, averaging 1 ft. in diameter in a day, or 1 tree in five minutes. The same men will fell about 30 to 40 oak or hard wood trees of the same size, or one tree in 15 minutes.

   Trimming off the branches takes about as long as felling. Cross-cutting trees into lengths takes about half as long as felling, for each cut.

   To fell a hard wood tree, 5 feet in diameter, is a day's work for 21 skilled men, the labor increasing about in proportion to the square of the diameter.

   Unskilled men will not do more than one-half to one-third of the work that would be done by skilled men.

   To fell a tree with the axe, commence cutting on the side towards which the tree is intended to fall, and cut in about two-thirds of the diameter, the lower part of the cut nearly horizontal, the upper surface well sloped upwards so as to free the axe. A few cuts on the opposite side, rather above the first cut, will bring the tree down. The direction of the wind and the natural inclination of the tree must be taken into account, and, if necessary, ropes must be used to pull the tree in the right direction.

To fell a tree with gun cotton 1lb. per foot in girth applied externally, or 2 oz. to 3 oz. per foot in girth in a 1⅜ inch augur hole, bored nearly through, will probably be sufficient.

2. *Making Entanglements.* Fell four rows of trees at the edge of the wood, or where a cleared belt is to be made, interlacing the branches. If the trees be very large, leave them standing, and cut down the branches and undergrowth, to form the entanglement. In a copse, cut the rods half through, and bend them down towards the enemy, and interlace them.

Time and Tools—

A squad of 10 skilled men may be expected to perform the following tasks in six hours, the entanglement being about 20 yards wide.

Entanglement of Fir trees: 1 ft. diam.
100 yds. 5 axes. 3 fms. 3 in. rope.
Entanglement of Hardwood trees: 1 ft. diam.
36 yds. 5 axes. 8 fms. 3 in. rope.
Entanglement of Underwood only:
50 yds. 4 axes 1 saw. 5 bill hooks.
Entanglement of Copse:
50 yds. 1 axe. — 9 bill hooks.

3. *Abatis* of branches brought to the spot by wagons, about 15 feet wide. 10 men will procure the necessary materials and bring them to the spot, if transport is available and the distance is not great, and will place and fix in position 20 yards in six hours. They will require 3 wagon loads of branches, 20 yards connecting poles, 20 stakes, also wire or chain, if procurable, 5 axes, 5 bill hooks, 2 saws, 2 mauls, 2 ropes.
4. *Clearing cover afforded by hedges* and forcing them over to the enemy's side. 10 men will on an average clear 500 yards in 6 hours. They will require 10 bill hooks, and will cut forked poles to aid in forcing over the hedge.
5. *Throwing down earthen banks to destroy cover.* Banks averaging 5 feet high and 3 feet thick—10 men destroy 100 yards in six hours; tools, 10 shovels. If there be trees growing on the bank, the roots will greatly increase the labor, and axes and pickaxes must be added and the task reduced.
6. *Improving hedges and banks for defence* by making banquettes and trenches where necessary, cutting holes in thick hedges to fire through, &c. 10 men on an average will prepare 200 yards in six hours. They will require shovels, 2 bill hooks.
7. *Shelter trenches* 4 feet wide, 1 foot 3 inches deep. 10 yards per man for a 6 hours' task in average soil. Two shovels and 1 pick per squad of 3 men. In very easy soil, no picks; task increased to 12 yards per man. In very difficult soil, men work in pairs, one having a pick,

the other a shovel; task, 15 yards for two men.

8. *Gun Pits.* 8 men, 1 hour; tools, 8 shovels, 6 picks.

9. *Limber Pits.* 4 men, 1 hour; tools, 4 shovels, 3 picks.

10. *Loopholing Walls.* 2 unskilled men make a loophole in a 14 inch brick wall in 10 minutes, in a 24 inch wall in 25 minutes, using a short crowbar or a pickaxe, the former being preferable. The top of a wall may be notched or crenelated more quickly than it can be loopholed, if it be thick.

11. *Stoccades.* If the timber be near at hand but not prepared, 8 men make 18 feet in 6 hours. The essentials are 2 picks, 2 shovels, 2 axes.

    To make good, neat, strong work, the following additional tools, &c., are wanted: 1 crosscut saw, 1 hand saw, 1 mallet and chisel, 1 adze, 1 carpenter's hammer, 2 large gimlets, 24 6-inch spike nails, 6 iron dogs.

12. *Palisades.* 6 men make 10 to 12 yards in 6 hours if the timber be on the spot. Tools, 2 picks, 2 shovels, 2 hand saws, 1 axe, 1 adze, 1 mallet and chisel, 2 hammers, 2 gimlets, 40 spike nails.

13. *Wire Entanglement.* 12 men make about 100 yards in 6 hours if materials for stakes and wire are near; requiring 2 axes, 2 bill hooks, 2 gabion knives for making 200 stakes, about 3 inches diameter and 4½ feet long, 2 mauls for driving them in 4 rows 2 yards apart, 1,500 yards wire, 2 pairs pincers.

14. *Barricading doors and windows* with timber may be estimated at half the labor required for

stoccades. Barricades of a rougher character must be estimated by judgment. If bricks be used, 2 unskilled men can lay abont 100 bricks in an hour.

15. *Destroying Houses by Gunpowder.* 40 lbs. in a central position will blow down a small dwelling house. The debris must be removed, which is a considerable labor.

16. *Breaching Stoccades or Walls by Gun Cotton.* 2 lbs. to 3lbs. per foot will destroy any ordinary stoccade, or breach a wall if not more than 2 feet thick. Palisades and abatis are most easily destroyed by the axe, wire entanglement by nippers.

17. *Walls are most easily knocked down* to open a field for fire, by means of a beam of wood worked as a battering ram by 6 or 8 men.

N.B. About one-tenth additional tools should always be provided, to replace those injured in use, and whenever cutting tools are used, means of sharpening them must be at hand.

In estimating the time required for the execution of works, it must always be borne in mind that the time necessarily occupied in deciding on what is to be done, in tracing it on the ground, in telling off the working parties, supplying them with tools and setting them to work, must always bear a very large proportion to the time actually spent in the work. A good organization, a well-defined chain of responsibility and frequent practice, are therefore most essential if entrenchments of even the simplest character are to be made on a large scale.

APPENDIX.

MEMORANDUM ON INTRENCHING POSITIONS.

These memoranda on intrenching positions have been approved by His Royal Highness the Field Marshal Commanding-in-Chief and are issued for general information.

By Order,

G. B. HARMAN,
Col. A.A.G.

All positions should be intrenched as far as time and means will allow. Intrenchments not only shelter the troops from fire, but they define the exact position to be taken up, which is often important.

The general superintendence of the intrenchments rests with the Commanding Engineer, under the direction of the General Commanding. When the trenches are of a simple nature, such as shelter trenches, they should be left, as much as possible, to be laid out and executed by the brigades and regiments who are to occupy them, subject to the general supervision of the Commanding Engineer, whose duty it will be to see that the different parts are in harmony. The orders to the troops for taking up and intrenching positions are issued by the Assistant Quartermaster-General's Department.

The advantages which it is desirable to obtain in choosing a position are—

a. A ridge for the first or fighting line, with a slope in front, clear of obstructions, which would mask the fire of the defence. It will be better if it has re-entering angles, in which the division artillery can be posted, so as to be out of range of the rifle fire of the attackers.

b. High ground in rear on which to mass the corps artillery.

c. Sufficient depth for the formation of the second line, with cover for the reserves.

d. Good lateral communications from one end to the other, not exposed to view of, or fire from, the enemy.

e. Farms or villages in front of the fighting line and on its flanks which can be used as outposts.

f. In choosing a position, it should be remembered that gentle slopes are easier swept by fire than steep ones, and afford less cover to the enemy. The slopes of the knolls on which artillery is posted should be as steep as possible in order to catch the shells aimed at them.

The first or fighting line. This will generally occupy the ridge of a hill, or line of hills, and should, as a rule, be covered by shelter trenches, which should be disposed so as to give a direct and sweeping fire to the front. Flanks are unnecessary with the breech-loader, and, therefore, to be avoided, as they diminish the front fire. Where the ridge has deep re-entering angles, it will generally be better not to continue the trenches too far into them, as the fire will then become too oblique, unless it is necessary that they should look into an adjacent slope, which cannot be seen from its own front. To prevent the enemy getting up such re-entering angles unobserved, a trench may be made across the head of it, to be manned by the reserves.

As a general rule the top of a hill consists of a flat slope breaking into steeper slopes as it descends. The nearer the trench is placed to the top of the hill, the easier it will be to obtain cover, but the trench must be placed so far down the hill that it can see the ground in front. A trench somewhat under the crest has the advantage that, if the enemy take it, they cannot use it as cover from which to fire on the reserves behind the hill. These trenches should be as continuous as the nature of the ground will allow, as this gives solidity to the defence.

Redoubts should not, as a rule, be used in the fighting line. They do not give a front of fire commensurate with the labour of making them, and are liable to be crushed by the enemy's artillery.

The second line. The object of the second line is to break the strength of the enemy should they succeed in forcing the first line. It must not be treated as a line to which the defenders of the first line are to retire, but as positions in and round which portions of the reserves can be concentrated, whilst the fugitives from the first line rally in their rear. There should be wide intervals between its parts, by which the defenders of the first line may retire without masking its fire. Redoubts 300 or 400 yards behind the first line will fulfil these conditions best, or, should there not be time to construct them, shelter trenches with wide intervals between them. Woods, houses, &c., may also be made use of.

Shelter for artillery. Epaulments should always be made for the artillery when possible. The following may be laid down as the rules which govern their position:—

a. The artillery should be out of the reach of rifle fire; it should not, therefore, if possible, be within 400 or 500 yards of the fighting line, otherwise it may have to retire when its fire is most wanted.

b. It must be so placed as to fire on the hostile artillery, or on the infantry when advancing to the attack. Whether it should direct its fire chiefly on the one or the other is a controverted point, but it will probably fire on the hostile artillery in the following cases: if it can catch it at a disadvantage, especially when unlimbering for action; if its fire is so heavy as to endanger its own existence; if the hostile artillery is causing serious injury to the defence; otherwise its *rôle* will probably be to fire on the advancing troops. High ground 400 or 500 yards in rear and re-entering angles in the fighting line will probably afford the best positions.

c. The artillery should be massed as much as possible. This, although affording a better aim to the enemy, ensures greater concentration of fire, greater facility in getting the range, and superior superintendence.

When the ground is dry, the epaulments should be sunk. A hole 18 feet long, 12 feet wide, and 1 foot 6 inches deep, is sunk and ramped to the rear at a slope of 4 to 1, the earth forming a parapet at the front and sides. If the ground is wet, the gun must be on a level with the ground, a parapet 2 feet 3 inches high being formed.

Artillery should not, as a rule, be placed in redoubts, but retired epaulments on the flanks of redoubts form good positions.

Amount of shelter trench required. The amount for the fighting line depends upon the distribution of the troops. This will of course vary with the nature of the position, but the general arrangement may be assumed as follows:—

Two battalions of a brigade would be in front line, one in reserve. Each battalion in front line would have five companies in the front trench and three in support. The battalion in reserve would occupy the second line. There would be, in addition, general reserves, which would consist of brigades and divisions, and which would be entirely independent of the first line and and its reserves, and would be massed on important points. They would probably be one-fourth or one-fifth of the whole force. If the men in the front trench be 2 feet 6 inches apart, this will give 5,600 infantry to a mile, exclusive of general reserves, and about 7,000 including them.

Each battalion, 320 strong, in front line, would have 200 men in the front trench who would occupy 500 feet of trench. This would require a working party of 100 men, and, according to our regulations, 100 picks and 100 shovels; but continential armies use a much smaller proportion of picks in easy soil like that about Aldershot, and probably 50 picks and 100 shovels would suffice. Each infantry battalion carries with it 100 shovels and 60 picks, which will, therefore, be sufficient. The supports would perhaps require shelter trenches also.

The engineers with a division at the July manœuvres will only carry 50 picks and 50 shovels.

The intrenchments of the second line would be executed by the engineers, assisted by the reserve troops.

When it is not expedient to break ground, shelter trenches will be shown by a tape stretched on pickets 3 feet high; redoubts by profiles.

The Field Marshal Commanding-in-Chief has directed that no intrenchments of any sort are to be thrown up on land not belonging to the Government; they must in such cases be indicated by tapes and profiles.

Redoubts should be used sparingly, and only in the second line, or to strengthen flanks, or for other special objects. The labour required on them is very great in proportion to the fire they give. They are liable to be crushed by the enemy's artillery. They are quite untenable unless plentifully supplied with bombproof cover. Artillery should not, as a rule, be placed in them, but rather in epaulments, retired behind their flanks.

Clearing the ground in front of a position is most essential, more so even than shelter trenches, but there seems no way of indicating it in peace manœuvres.

The edge of a wood forms a formidable obstacle. The trees should be felled to form abatis and entanglements. The time to form it will vary with the nature of the trees. The following is given as an average:—100 yards of entanglement can be made by twenty men in six hours. They will require ten axes, two saws, ten billhooks, eight fathoms three-inch rope. An entanglement may be shown, like a shelter trench, by a tape.

In constructing trenches, care must be taken that they do not obstruct the offensive return which the defending force should always have in view. The experience of the French in the war of 1870, and of the Spaniards in the present one, goes to show that offensive returns are not made successfully by those troops who have just repelled an assault; they probably, therefore, should generally be made either by advancing from a flank or by an organized forward movement after the enemy is exhausted by fruitless attacks.

A. C. Cooke,
Col. C.R.E.

Aldershot, June 30th, 1875.

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ADDENDA.

p. 32 (foot note). The late artillery experiments at Dartmoor have demonstrated that when range finders are used, and the necessary conditions for accurate shooting exist—clear range, clear weather, level platform for the guns, and careful laying—the practice with our 16-pounders is so good at ranges as great as 4,000 yards, that within this distance troops in compact formation would suffer serious loss if seen by artillery in position.

p. 56 (foot note). The experiments alluded to at p. 32 seem to show that at ranges up to 1,000 yards artillery fire, aimed at a front line, takes effect as far as 600 yards in rear of it, causing casualties in supports and reserves equal to about one-third of those in the front line; at greater ranges, as the trajectory becomes more curved, the effect on the troops in rear becomes less marked, and reaches to a shorter distance.